REPORT RESUMES

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BY- WEBER, JOHN

MIDWEST COMMUNITY COLL. LEADERSHIP PROGRAM

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AT THIS 1966 INSTITUTE, THE FOLLOWING PRESENTATIONS WERE GIVEN--(1) AN INTRODUCTION TO THE SYSTEMS APPROACH, A PROCESS OF PLANNING, DESIGN, DEVELOPMENT, IMPLEMENTATION, EVALUATION, AND REVISION OF THE INSTRUCTIONAL PROGRAM (OAKLAND COMMUNITY COLLEGE), (2) A DESCRIPTION OF MANAGEMENT AND METHOD IN THE USE OF THE SYSTEMS CONCEPT (OAKLAND COMMUNITY COLLEGE), (3) AN AUDIO-TUTORIAL EXPERIMENT IN TEACHING BOTANY (PURDUE UNIVERSITY), (4) THE USE OF FINANCIAL INCENTIVES TO IMPROVE QUALITY AND INCREASE PRODUCTIVITY OF INSTRUCTION (MERAMEC COMMUNITY COLLEGE, ST. LOUIS), (5) THE ROLE OF THE ADMINISTRATOR IN ESTABLISHING FACULTY ATTITUDES TOWARD INSTRUCTIONAL EXPERIMENTATION AND INNOVATION (CENTER FOR RESEARCH ON LEARNING AND TEACHING, UNIVERSITY OF MICHIGAN), (6) THE USE OF OPERATIONAL GAMES TO TRAIN NEW ADMINISTRATORS OR TO CHECK CURRENT DECISION-MAKING PROCESSES (COORDINATING COUNCIL FOR HIGHER EDUCATION, METROPOLITAN ST. LOUIS), AND (7) NEW DEVELOPMENTS IN PROGRAMMED LEARNING (MICHIGAN BELL TELEPHONE COMPANY). (HH)

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ADMINISTRATION AND INNOVATION

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ADMINISTRATION AND INNOVATION

Papers from The Sixth Annual
Community College Presidents'
Institute
1966

The Midwest Community College Leadership Program
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John Weber, Editor

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INTRODUCTION

The Midwest Community College Leadership Program is a cooperative agency of three major Michigan Universities--Michigan State University, University of Michigan, and Wayne State University--to improve the character and quality of preparation available for practicing and potential community and junior college administrators throughout a twenty-state Midwestern area. The three Michigan universities, operating through their Coordinating Council, offer a variety of educational experiences for those presently employed in community colleges and for those who seek to make community college administration their career.

A major project of the MWCCLP each year is the Annual Summer Presidents' Institute. The location of the Annual Institute is on a rotating basis, held on the campus of one of the three universities. These Institutes attempt each year to deal with a major area of paramount interest to community college administrators. The reader may be interested in the themes of past Institutes:

1961	"Administering the Technical Program"
1962	"The Administrative Process"
1963	"Administering the Instructional Program"
1964	"Practice in Administrative Behavior"
1965	"Administering the Student Personnel Program"

The Sixth Annual Institute was held at Wayne State University in April and July, 1966. The Spring and Summer sessions were each attended by community-junior college presidents and by many students and others in the field who were particularly interested in the Institute's general theme: "Administration and Innovation."

Nine of the presentations made at the 1966 Institute are included herein.

Russell G. Mawby, speaking for the W. K. Kellogg Foundation, outlines the history of that organization's interest in community colleges. In doing so, he touches also on the seven program divisions, organization and structure of the Foundation, limitations to its aid, and procedures for submitting requests.

Winfred A. Harbison, Vice-President for Academic Administration at the host institution, Wayne State University, outlines the Institute's general plan and suggests six levels of involvement in community colleges.

"Planning, implementing, and revising," states Robert K. Branson, Project Manager at Oakland Community College for Litton Instructional Materials, Inc., "are the three words which most closely define the systems concept." In this article, "The Systems Approach to Learning: An Introduction," Mr. Branson delineates the purposes and constraints with which he feels the instructional systems approach can operate effectively.

In the presentation by John E. Tirrell, President of Oakland Community College - "A Case Study of a Totally Independent-Study Community College" - we learn the history of a new (1965) institution which is attempting to implement many of the concepts discussed by Mr. Branson in the preceding paper. Of particular interest to administrators may be Dr. Tirrell's outline of the management, methods, and procedures used with the Systems Approach at Oakland Community College.

S. N. Postlethwait, Professor of Biology at Purdue University, discusses his own innovation which has become one of the major advances in methods of teaching: "An Audio-Tutorial Approach to Teaching Botany." Obviously the key man in developing this approach, Dr. Postlethwait discusses herein the history, experimentation, and conclusions of his research, as well as some of the advantages and disadvantages of the audio-tutorial approach. In a postscript, he has added a short section on "How to Prepare an Audio-Tutorial Lesson."

Campus Director, Glynn E. Clark at Meramec Community College, details some of the "Innovation at the Junior College District of St. Louis - St. Louis County, Missouri." "The best way to improve instruction and productivity of instruction," says Dr. Clark, "is to subsidize instructional research and encourage faculty members and pay them to do some of these things they believe in, that they want to do." How this is done in his District makes intriguing reading.

"The Role of the Administrator in the Improvement of Instruction" is discussed by Stanford C. Ericksen, Director of the Center for Research on Learning and Teaching at the University of Michigan. Dr. Ericksen briefly touches on the philosophy and operations of the Center, and he offers some challenging ideas about administrator-faculty relationships when instructional changes need to be made.

A subject that is unfamiliar and interesting to many community college administrators is "The Nature of Operational Gaming." John Forbes, Executive Director of the Coordinating Council for Higher Education, Metropolitan St. Louis, Missouri, defines operational games and shows how some of them may be used to train new administrators or to provide present administrators with a means to check on their own decision-making characteristics.

Finally, C. Glenn Valentine, General Staff Assistant of Training Methods at Michigan Bell Telephone Company, tells how his company put many of the new advances in instruction to use in a training program conducted by his company. He outlines the procedures used and the results obtained, as well as contrasting these results with those obtained by the more traditional methods used by the company in the same training program.

Ralph W. Banfield

Ralph W. Banfield
Executive Secretary
Midwest Community College
Leadership Program

"W. K. KELLOGG FOUNDATION'S INTEREST IN THE COMMUNITY COLLEGES"

Russell G. Mawby
Vice-President - Programs
W. K. Kellogg Foundation

I appreciate very much the opportunity of meeting with you today. On behalf of our Foundation, may I extend greetings and express our appreciation for being identified with the Community College Leadership Program.

Mr. Banfield and I have agreed that this luncheon session should be very informal. Therefore, I will make just a few comments on the topic of our Foundation's interest in community colleges. Then hopefully we can discuss together some of the kinds of questions that will be of greatest interest to you.

To provide for you some general information regarding the Foundation, we have copies of our General Information brochure. This gives a brief historical and philosophical statement, describes the seven program divisions and the organizational structure, and indicates limitations to our aid and procedures for submitting requests. Of particular interest to you will be the fact that effective September 1, the new Director of our Division of Public Affairs and Education will be Dr. Robert E. Kinsinger. Many of you know Bob since he has been identified with the community college movement in a variety of ways, most recently with the development of paramedical programs in the community college system of the State of New York. He is the person with whom many of you will have contact in the future.

One of the challenges to a Foundation such as ours is to be sensitive to current developments, to the dynamics of situations of the day, to problems that need the kind of resources that a private foundation can provide.

In the fields of endeavor with which we are concerned---education and public affairs, agriculture, medicine and public health, nursing, dentistry and hospital administration---we are continually concerned with somehow sensing the trends of the time, anticipating significant developments, and determining how our limited Foundation resources may make a maximum contribution to the well-being of people.

In the late 1950's, as we were assessing the situation in education in this country, and specifically anticipating needs in higher education, our Foundation became convinced that the most significant educational development of this century for our country was the development of community colleges. We are still convinced that this is true. Consequently Dr. Morris, our Foundation President, recommended to our Board of Trustees that the community college movement is one with which our Foundation should be strongly identified. Subsequent appropriations by our Board provide tangible evidence of this Foundation's commitment to the community college movement for which you are providing vital leadership.

Our Foundation first assisted in a major way the community college movement through the American Association of Junior Colleges, when in 1960 we made a substantial grant to AAJC to help strengthen their role of leadership. The wisdom of the decision is evidenced by the flourishing program of AAJC and the viable leadership it is providing for two-year institutions of higher education, nationally and internationally.

In the rapid development of these institutions in this decade, it immediately became apparent that a crisis existed in terms of administrative leadership for individual institutions throughout the country. Thus the next logical phase of our support was assistance to ten institutions in establishing

Community College Leadership Programs for the preservice and inservice training of community college administrators. As participants in this Seminar, you obviously are aware of these Centers and their activities.

Finally, as community colleges have firmly established their college-parallel programs, increasing attention has been given to the significant contribution of these institutions in occupational education. To encourage such institutions to develop these occupational programs, our Foundation began four years ago to make small development grants to individual colleges to assist in developing pilot or demonstration programs in different specialized fields ranging from the health-related occupations through data processing to fisheries technology. With the rapid growth in the number of such institutions, it was soon apparent to us that we could not possibly meet the demands of all institutions for such developmental assistance. Thus last year we made another significant commitment to AAJC to establish three Task Forces with a professional staff to provide national leadership in engineering-related, business-related, and health-related occupational fields. The full-time personnel have been recruited, the Task Forces are completing their organizational details, and increasingly this phase of AAJC's leadership and service to two-year institutions will be available.

Very briefly then, this is our interest in community colleges. We are still convinced that the community college movement is one of the most significant developments in higher education for this century. We have been greatly impressed with the tremendous growth that has taken place, with the acceptance of the community college idea in communities throughout the country, and with the excellence of the programs now underway. Our Foundation has been very pleased to be identified with this development, and we anticipate there being other ways in the future in which our Foundation can assist.

"WELCOME ADDRESS - SIXTH ANNUAL INSTITUTE OF COMMUNITY COLLEGE PRESIDENTS"
at McGregor Memorial Conference Center - Monday, April 25,1966

Winfred A. Harbison
Vice President for Academic Administration
Wayne State University
Detroit 2, Michigan

For both Wayne State University and our two "big sister" Universities (University of Michigan and Michigan State University), I am happy to welcome you to the Sixth Annual Community College Presidents' Institute -- Spring Term!

Dr. Hall, Dr. Rislov and their colleagues from Michigan and Michigan State have planned a fine conference on an important theme. I'm glad this is the year for the Institute to come to Wayne.

I. Before it is over, you may decide this is "the week that was"!

1. This week the University is being officially visited and evaluated by a team from the North Central Association (once in 10 years).
2. We have a student boycott at a nearby high school and a threatened one-day walkout in several high schools.
3. In nearby Highland Park, there may be a teachers' strike. These items may not be "innovation," but they certainly test the effectiveness of administration.
4. On the lighter side, and for evening activities, the Detroit Tigers are playing at home this week. By Thursday the Red Wings will be home, playing for the Stanley Cup, but I doubt that tickets can be secured. Also, by mid-week you can cry with us old-time Detroiters because the 1972 Olympic Games will be awarded to another city than Detroit.

II. Some of you may not know that this University began, in part, as a junior college and has had a long and close association with community colleges.

1. Until 1956 when we became a state university, we were a member of the State Community College Association and received some state assistance as a pseudo-junior college.
2. From 1958-60, Wayne led a citizens' survey of community college needs in the six counties of southeastern Michigan.
3. Right now the University is cooperating in various ways with the effort to establish a community college district in this county. We are hoping this program will be approved by the voters on May 9, so that we can develop a pattern of five community colleges in and near Detroit. (If any of you would like to participate in this campaign, I'm sure we can provide you opportunities.)

III.

1. During the past generation we have seen community colleges develop into the newest major segment of our total educational enterprise.
2. Michigan has had a few of the oldest community or junior colleges in the nation, and we now have some of the largest ones. (Nearby Henry Ford Community College has around 10,000 and is still growing.)
3. The Institute program calls for you to visit some of the nearby community colleges, so that you will have some basis to make judgment regarding their general quality, as well as their possibilities for "innovation."

IV. Recent developments, both local and national, have re-emphasized the six levels of involvement in community colleges. As presidents and administrators, I'm sure you are aware of all six of these levels of involvement, but maybe you will not agree with all of my distinctions or delineations.

1. First, is the State involvement, whether it be the Legislature, the Department of Public Instruction or a special community college authority. A few states are still ignoring community colleges, but most are now thoroughly convinced of the great need and value of their varied programs. More than 85% of community college students are in public colleges.
2. Second, most community colleges, at least in Michigan, have been established by the direct initiative and vote of the people of the district. Neither our elementary-secondary schools (I guess K-12 is the term we must now use!), nor our universities have had as much direct popular involvement in their launching as have our community colleges. Therefore, they are "people's colleges" in the best sense of the word. This can mean a "no" vote, as well as a "yes" vote.
3. The boards of control, in practice, represent another element of involvement, even though they are elected by the voters of the district in most cases. These boards often attract younger citizens and tend to give a forward thrust to policy developments. The state, the people of the district and the board all theoretically represent the same public, but in practice administrators are aware of five distinctions that sometimes test administrative skills.

IV. (Continued)

4. The role of the President or other administrator in community colleges should be clear and precise, since they are relatively new institutions; but you gentlemen will doubtless spend considerable time here at this Institute in comparing notes on the president's role vis-a-vis the other five elements in my sextet.
5. The role of the faculty in community colleges is still a developing one, or at least a variable one. Finding the proper niche between the high school teacher and the senior university professor is not always easy, whether it be in a community college, a state college or a private college. Since the situation in community colleges is still somewhat fluid, I would hope that faculties would choose to concentrate upon those things which they can do best--effective teaching, counseling, curriculum development, evaluation and long-range planning and leave administration to the administrators.
   (To fill in for my ignorance, I would like to ask a couple of questions: How many of your colleges have units of the Federation of Teachers? Do you have chapters of AAUP?)
6. Finally, and certainly not least, is the role of the students in the community colleges. We are all familiar with the traditional five-fold function of community colleges, and the more modern adaptations of this pattern. But more important in the long run is the basic role of the student in giving direction and focus to the community college. This issue assumes significance from the student revolts--all the way from the University of California to our current, local boycott at Northern High School. How does the student acquire a

IV. 6. (Continued)

meaningful role in the total educational process? I would hope you could do better in the community colleges than most of us have done in the large universities. I doubt seriously that the Latin-American way of students dictating and controlling through political action programs is the correct answer. But I belive we can and must find a better way to involve students or their leaders, in the significant policy-making and decision-making processes of our educational institutions, whether they be community colleges, universities or high schools.

At least, these general observations will have broken the ice, and you can now proceed to more specific topics. Again, we are pleased that you have come to this Institute, and I feel confident you will have an exciting "spring term."

"THE SYSTEMS APPROACH TO LEARNING: AN INTRODUCTION"

Dr. Robert K. Branson
Project Manager at Oakland Community College
for Litton Instructional Materials, Inc.

I. Overview

The termination of World War II likely will be reported as the starting point of new approaches in management and planning techniques outside specific industrial and military applications. During the first decade after the second World War, applications of the Systems Approach were made in which humans were considered functional components of operating man-machine systems. The human factors area has been concerned with the determination of human characteristics which place constraints on the design of other system components.

The second decade of the post-World War II era brought serious attempts to apply the total systems concept in the education and training environment. Subsequently, the systems approach presented many of the same hopes and the same problems that all major innovations in education have brought. Many past inventions were offered as panaceas and can be easily recognized; moving pictures and audio-visual aids were once touted as magic. Then, the unfortunate teaching machine movement reached its zenith in the early '60s and its nadir shortly thereafter.

Each half decade has brought with it a special kind of magic which, all alone, was going to solve the problems of the educational world. Recent experiences show that the systems approach can be an immensely valuable tool in approaching the complex problems of education, but it does not irradicate those problems. It does provide an orderly approach to their solution.

A. What the Systems Approach Is

It is most appropriate to define the systems approach operationally. The following functions based on the elementary cybernetic (Smith and Smith, 1966) model would probably be required by most authorities in the field.

1. The systems approach applied to instruction is a management tool calling for planning, design, development, implementation, evaluation and revision. The last two functions, evaluation and revision, make the systems approach unique.
2. A functioning system has in-puts, processes, out-puts, and feedback all designed and integrated to accomplish a specific mission objective.
3. In an instructional system, the learner becomes an integral part of the operation of the system. Without the responses from the learner, the system does not have sufficient data to update itself.
4. Each functional system component must be defined in terms of the specific, measurable objective it helps to achieve. The system must deal with identifiable and measurable objectives and goals.

B. System Characteristics

A description of the most important single characteristic of a system depends on whether one is using it or building it. If one is constructing it, a system, like a building, is nothing more than the materials and labor to build it, and the detailed plans required for assembly. Yet, as one sits in the air-conditioned comfort of a new building there is certainly a Gestalt which is phenomenologically different than the sum of bricks, mortar, carpets, steel, rivets and the other raw materials.

In building a system, it is essential to analyze each component and isolate its function. Often, people fail to distinguish among those who talk about a system from an operations standpoint and those who talk about a system from a construction standpoint. As one identifies the elements of a system necessary to build it, one can say that it has finite and common elements.

Since individual system elements are well known and simple to understand, it is easy to conclude, as some have, that the systems approach has been used by good teachers and administrators all along. Granted, some initial applications of systems have been primitive, and have resembled traditional management approaches. Steel, copper, aluminum, and rubber are all required to build trains. However, a different mix and process of these same materials will also build a jet. Both vehicles are designed for transportation.

II. The Development of an Instructional System

A. Comparison to Other Approaches

A simple heating system, with fuel, furnace and thermostat, can serve as a model for an elementary instructional system, and provide a useful analogy. A heating system has an input (fuel), a process (burning fuel), an output (heat), and a mechanism (thermostat and control) for controlling all of them. Admittedly, this is a simple example, but an instructional system has readily understandable elements which permit simple analogies. Conversely, it should not be inferred that operating an instructional system is as simple as operating a heating system.

In order to use the systems approach, based on the cybernetic model, it is first necessary to produce a highly detailed, highly specific, well documented plan. A critical part of this plan is a statement of the educational mission: the functional purpose that the system is trying to accomplish. A second critical feature of the systems approach is the precision required in writing learning specifications derived from the mission.

B. Internal Evaluation

A third critical feature of a developing instructional system is the method of initial evaluation. Evaluation of progress must be made on the basis of system objectives: the system must be evaluated on its ability to achieve its objectives. Progress can only be evaluated against the objectives that have been set.

No legitimate instructional system exists without this ability to be evaluated against its own objectives and mission. Regardless of what similar schools are doing, regardless of what other systems are doing, regardless of what "ought" to be done, the instructional system must first be evaluated against its mission objectives.

Historically, schools have typically asked: "Are we doing the same as similar schools with the same kind of students?" Eventually the success of the instructional system must be compared with success at other institutions. This comparison must not be prematurely made. Evaluation comes when the system is able to accomplish most of its own objectives. Eventually real world requirements must be analyzed in assessing the progress of the system. But, the initial evaluation must be internal.

To continue, the process of measurement, testing, and evaluation must also be reviewed. Each objective that the system is designed to accomplish must be individually checked to verify its accomplishment. The testing and measurement process requires effort to obtain the precise kind of information needed upon which to base reasonable management decisions. The complete loop requires one more step: revision and modification based on this evaluation.

The dilemma referred to earlier must now be faced: should a system be compared to outside organizations or should it be judged solely on its ability to accomplish its mission objectives. Regardless of these basic decisions, if the system has been based on real world considerations, if it is accomplishing its own objectives, it should also compare favorably with other institutions of its own kind. The simple flow chart in Figure 1 indicates the desired flow of work.

To continue the development of the system, having satisfied the minimum requirements for statements of mission objectives, the input and output functions, and the feedback-control function, the total system can begin to operate and can define special purpose sub-systems, to perform individual functions: testing, creating, revising, etc.

It is the initial step of defining a mission and deriving specific performance objectives that is the most difficult to take. To take this step, individual planners must make large numbers of discrete decisions about education and instruction which, too often in the past, have been made by time rather than men. If one doesn't state measurable performance objectives in advance, he certainly can't be held responsible for achieving them. But, rather than stand on history and tradition, if the educator

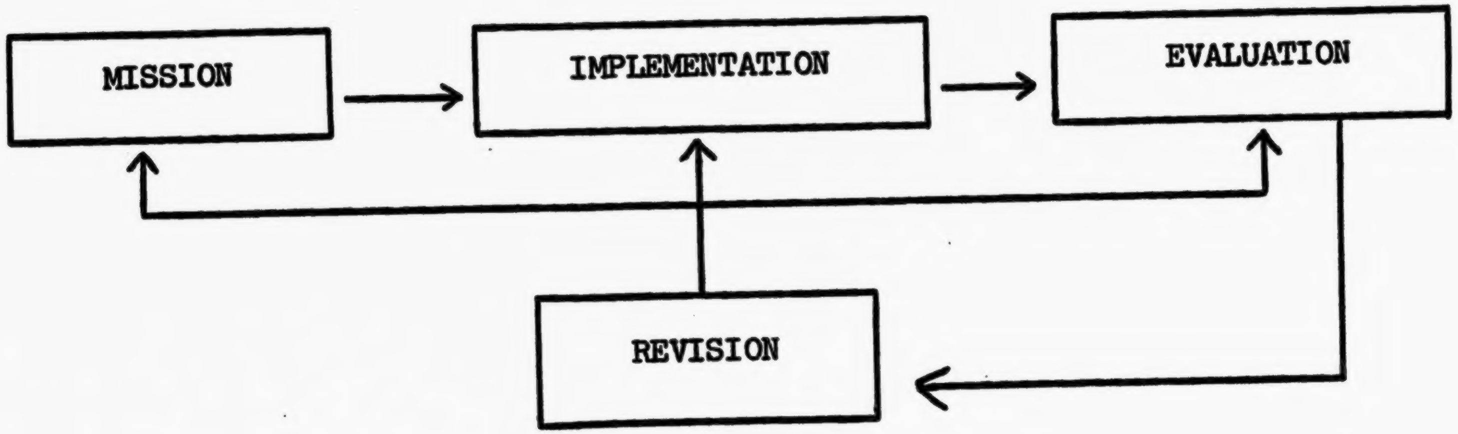
MISSION
IMPLEMENTATION
EVALUATION
REVISION

FIGURE 1. FLOW OF WORK FOR IMPLEMENTATION, EVALUATION, AND REVISION.

chooses to develop measurable objectives, he can then evaluate his progress towards the accomplishment of the objectives and know where he stands. Evaluating the reality of achievement makes it possible to see the relative success of one's effort.

C. Defining Overall Objectives

Fundamental to the success of any system is the notion of the accomplishment of the system objectives. In an instructional system, objectives are usually described as the terminal performance expected of the student. Terminal performance is the desired end product or knowledge resulting from an instructional sequence and it is the concept of terminal performance that differentiates a performance-based model from a time-based model.

In stating mission objectives, it is necessary to describe generally what is to be accomplished within fairly broad time limits. The function of the instructional program is clearly defined by these stated objectives. As a result of this planning it can be said that specific terminal performance coincides with the mission objective of the institution, because they have been planned to be consistent.

1. Terminal Performance Specifications

Terminal performance is described in advance just as blueprints describe in advance what form a building is to take (Taber, Glaser, and Shaefer, 1965). Consider for example, the electronics curriculum at the Community College level. Prior to the implementation of an electronics program many specific questions must be answered:

> Should the curriculum be oriented primarily toward recent high school graduates?
>
> Should it be oriented primarily toward adults?

What about people who are employed in industry?

Once there are tentative answers to these questions, then more specific questions can be asked:

What are the immediate skills needed by an electronics technician in today's market?

What does he need to know how to do?

Must he know how to use an oscilliscope? Yes.

Must he be able to repair TV sets? No.

This process of defining terminal performance in detail is a critical, but not impossible task. First, it is necessary to describe what the individual must know the day he leaves, not how it is proposed to teach him. No time is spent designing instruction until it is specifically known what the student must know. Thus, terminal performance specifications are defined on the basis of what the student needs to know the day he leaves the school.

If he must know how to use an oscilliscope, he must be able to demonstrate this skill the day that he graduates. It is of no value to a graduate that his transcript shows credit for a course on the oscilliscope taken two years before.

As they must be stated, terminal performance specifications (TPS), imply measurement and evaluation of the student's knowledge and skill. The judgment that a student has learned what the TPS requires is made by the instructor, based on data he has collected about the student through ratings of performance and tests.

When the instructor certifies that a student has achieved the TPS, the statement is categorical. That is, the instructor says, "This student has achieved TPS, number I.O." The criteria used to reach the conclusion have chooses to develop measurable objectives, he can then evaluate his progress towards the accomplishment of the objectives and know where he stands. Evaluating the reality of achievement makes it possible to see the relative success of one's effort.

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all been satisfied. The student has demonstrated that he knows what was expected of him. Then the decision is made by the instructor.

In order to make reliable categorical judgments about student achievement, the instructor should have employed the best testing, rating, and evaluating procedures abailable to him. He must expect to be wrong about some students. He must define criteria which are realistic, based on each student's prior knowledge and his abilities, aspirations, and achievements.

The day that the student leaves the instructional environment, his knowledge and skill can be described precisely by the terminal performance specifications. This description of his knowledge is supported by performance data, test scores, and instructor evaluation and judgment. For this feat to have been accomplished, the student's complete path through each separate course must be planned in advance and the necessary contingencies allowed for.

2. Fitting the Curriculum to Real World Needs

One of the principal characteristics of an instructional system is that its evaluation of its own performance is always carried on in accordance with previously established criteria. Thus, terminal performance specifications must be consistent with the mission objectives of the institution, and the mission objectives of the institution must be consistent with the real needs of the people in the community.

By establishing an information system which allows for perpetual updating of student records, relevant employment and scholastic data can be continuously accummulated. This data can then be used for follow-up studies of graduates and former students. These students, their employers and later instructors can provide valuable information about the relevancy and quality of instruction provided for these students, through access to information about failures and successes.

Once the graduates, employers, and other interested members of the community have acknowledged that the school is satisfying real world requirements, the last link in the instructional chain has been added. Because local needs may tend to weigh heavily in the determination of course content and curriculum, care must be taken to prevent teaching students in obsolescent subject matter and skills. A regular assessment of national trends in education and training must be made in order to keep instruction in step with the technological needs of the society.

Accounting, chemistry, sociology, English, and other courses typically found in college academic programs deserve precisely the same task analysis and verification of objectives demanded in technical training areas. Rather than seek this information from employers, academic departments in four-year institutions must be contacted for descriptions of entry knowledge expected of their students.

Persistence and diplomacy may well be required to get content information and performance expectations from instructors not accustomed to dealing with these concepts. Traditional universities are not prepared to offer precise descriptions of student requirements, but perceptive systems designers can obtain useful, if sketchy, information.

By comparing the requirements at various universities, the descriptions of course content and the statements about expectations of student knowledge, it will be possible to increase the precision of course specifications to meet the content and achievement requirements of the transfer institutions.

In the occupations where skilled performance by the student is important, there is a good chance that specifications already exist in the form of job descriptions. Unfortunately, performance specifications for a baker are more readily available than those for a poet.

3. Historical Influences on the Curriculum

As one moves from skilled performance requirements to general knowledge requirements, it is more difficult to maintain validity and reliability in instruction. From both planning and philosophical standpoints, unique problems arise in what may be called the "passive"subject matter areas: in literature, art, and music; in history and civics, in drama and recreation because an answer has not been forged to the question: "What specific accomplishments do we expect from students in these courses?"

Literature, art, music, history and philosophy are integral parts of the liberal arts curriculum in virtually all institutions of higher learning. It is the author's view that these courses have become well established in the curriculum, not because we have convincing evidence of their real contribution, but, they are there because they have always been a part of the curriculum. These courses were central parts of the curriculum when the Romans first put teachers on the public payroll. [1]

It is doubtful that anyone would suggest discarding liberal arts courses solely because they have maintained their position in the curriculum due to seniority. However, the long term measurable effects of every course must ultimately be assessed through a systematic analysis. Obviously, if it can be shown that these courses, and others, make a solid contribution to student knowledge, then they have earned their place. If we must affirm their contribution on faith, however, then the offering of any such course should certainly be questioned.

Further, regardless of why a course must be included in the curriculum---and there are many external reasons, such as accreditation and state approval---it should be designed to achieve certain terminal behavior in the student.

By indicating in advance why a given subject matter is thought to be important, it will be possible to assess the long term contribution of this subject matter to the student's knowledge. By accumulating data about the students who take the course, adequate information can be assembled upon which to make a judgment about the necessity of the subject matter in the curriculum. For a systems approach to work properly, it is as important to eliminate dead weight as it is to add the exciting new subject matter which comes along almost daily.

D. The Use of Instructional Media

Instructional media are vehicles for presenting information to students in an effective and efficient manner. The principal function of an instructional medium is to serve as an input to the student under a specified set of circumstances. The following list of media is indicative of the variety available:

Textbooks, encyclopedias, and reference works

Topical paperbacks, workbooks, and pamphlets

Technical publications and periodicals

Audiotape and sound recordings

Videotape and motion pictures

Slides, transparencies, filmstrips, flip charts, maps and globes

Models, cut-away versions, specimens, and other display objects

Articulated combinations of various media

By defining the precise specifications of each instructional medium, it is possible to indicate which of these media is most effective in developing particular responses in the students. One would not attempt to teach typewriting solely by auditory inputs. The need for extensive practice is obvious. Evidence suggests that there are many knowledge courses which should require just as much practice, even though it is rarely provided.

Ordinarily, specification of a given medium of instruction does not necessarily indicate the mode of response expected of the student. There is no reason to avoid asking students highly specific questions about information contained in instructional films, although such questions are rarely asked. Film is a medium which could be viewed and reviewed as often as the student likes. The long term success of carefully selected media can be determined by comparing the student learning characteristics with the various media and by providing reasonable hypotheses for other approaches to teaching the same problem. By manipulating media and various response modes, performance can eventually be increased.

E. Evaluation and Revision

In an operating instructional program one process identifies the critical difference between the "open-loop" design of traditional approaches and the "closed-loop" design of the instructional system approach based on the cybernetic model: Revision based on evaluation of feedback.

The data collected on student progress may be interpreted in at least two common ways:

a) We may assume that instruction is adequate and that only the students are deficient, or

b) We may assume that the students are real and if they fail to learn, the instruction may not be adequate.

Further, if instruction is judged inadequate, gross generalizations and oversimplifications may confuse the causes:

a) The time of day the course is offered

b) Inadequate time spent on lecture preparations

c) Author of "the" textbook not writing clearly

d) Too many interruptions, etc.

Notice in these gross unsupported generalizations the dramatic similarity between them and the "demon theory" of disease which was widely accepted before modern science. Then, if a man became ill, he was believed to be possessed by evil spirits, and the therapy given was often torture in order to make the body an undesirable place for the demon to live.

Contrary to this "single cause" methodology, modern scientific diagnostic procedures are used to identify specific symptoms of illness, to infer the most probable cause of these symptoms, and to embark on a program of therapy intended to eliminate the cause of the symptoms, not the symptoms, _per se_.

Thus, identification of specific symptoms involved in the student's failure to perform adequately in school may provide the only possible data upon which to base recommendations for changes in the regular instructional program. Each student may have a slightly different symptom and because of variations in past experience and ability, may require slightly different "therapy."

A change may be required in the number of programmed texts used, or an increase in the number of pages of reading in the regular text, or moving a film sequence three weeks earlier, dropping a lecture, revising a test, or making other changes. These are the kinds of highly specific revisions that can be effective only if detailed objectives have been developed in advance so that progress toward those objectives can be accurately measured. These revisions will produce better results only if we are able to identify each separate and specific cause of educational problems.

There is no question that evaluation, interpretation, and revision require a substantial effort. But, until it is understood that the processes of instruction evaluation and revision--the practice of the educator--require as much study and effort as the study and practice of dentistry, the unsuccessful gross oversimplification of problems will continue to prevail. So long as the leaders and seers believed that demons caused bad breath--anatomy, physiology, chemistry, and anasthesiology were of little value. Conversely, when these sciences were combined and the dentist himself developed many separate tools for highly specific jobs, giant steps were taken in the repair and preservation of human teeth. It is generally believed that a man's mind is as complicated as his teeth. Education still has this evolution to go through.

Problems of gross attitude, of gross motivation, and other problems described only in broad general terms, are not centrally considered in the systems approach. On the contrary, literally thousands of highly specific problems based on information collected from the operation of the system will be analyzed and individual efforts made to solve each of them. The instructional system is to be judged on its ability to accomplish internal objectives. Hopefully, these objectives will have been selected on the basis of what students need. Progress is evaluated according to that aim.

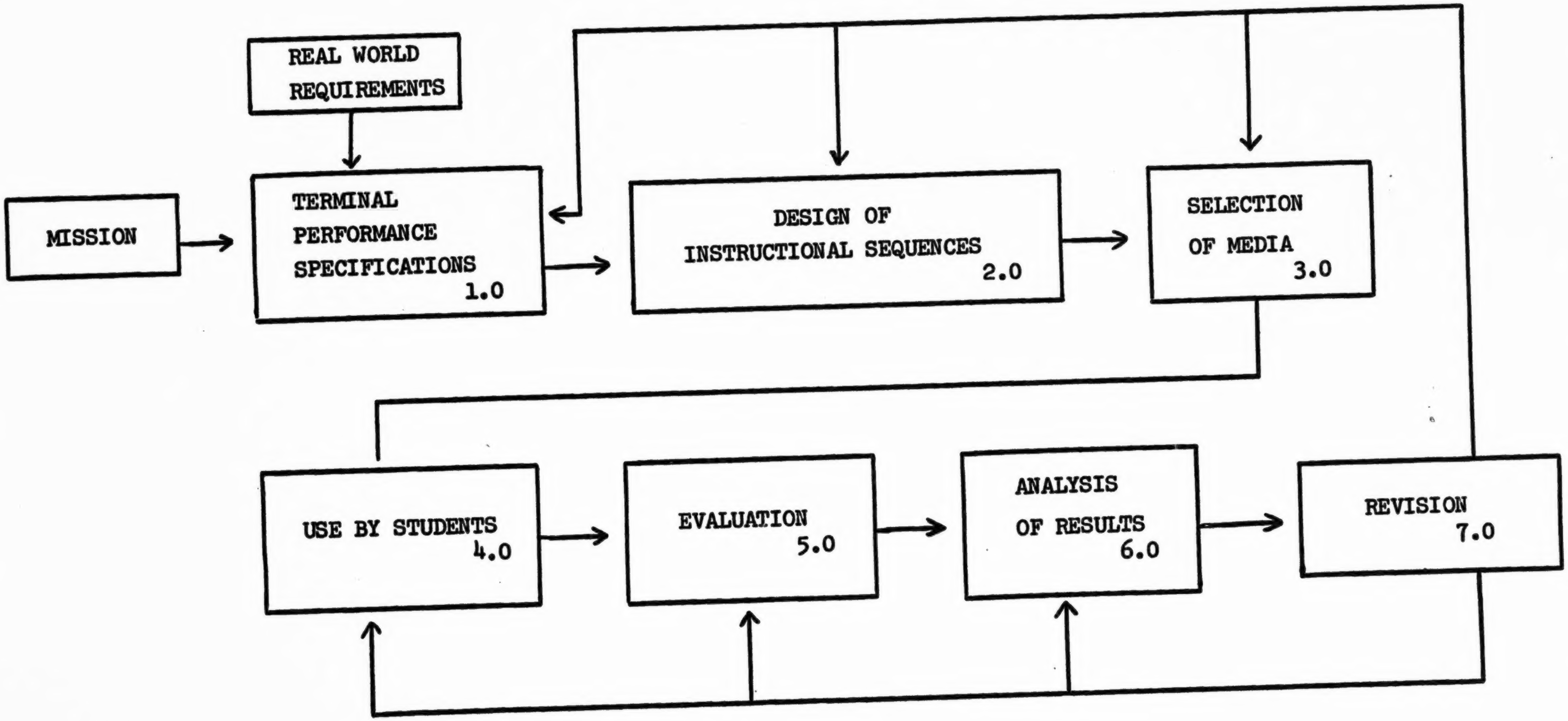
REAL WORLD REQUIREMENTS
MISSION
TERMINAL PERFORMANCE SPECIFICATIONS 1.0
DESIGN OF INSTRUCTIONAL SEQUENCES 2.0
SELECTION OF MEDIA 3.0
USE BY STUDENTS 4.0
EVALUATION 5.0
ANALYSIS OF RESULTS 6.0
REVISION 7.0

FIGURE 2. THE IMPLEMENTATION AND REVISION FLOW FOR AN INSTRUCTIONAL SYSTEM. NOTICE THAT EACH FUNCTIONAL COMPONENT IS REVISED IF THE OUTPUT IS NOT ADEQUATE. THE OUTPUT OF THE STUDENT IS AN INTEGRAL PART OF THE INFORMATION FLOW.

III. Summary

Planning, implementing, and revising are the three words which most closely define the systems concept. A system must iterate. It must go through the process of design, implementation, feedback, and revision. This procedure is summarized in Figure 2.

Students are tested not just to see how well they do, but to find out the weak parts of the instructional system. Think of iteration as a process of "bootstrapping" according to highly specific data.

The instructional systems approach can be summarized in these statements:

a) Decide what behavior the students are to learn (Function 1.0)

b) Plan instruction specifically to achieve performance objectives (2.0) (3.0)

c) Measure carefully to find out how much was achieved (5.0)

d) Analyze the results in order to determine the causes of failure when it was found (6.0)

e) Revise the plan to try a different approach where required (7.0)

f) Evaluate total progress against internal system objectives (7.0)

With these constraints and purposes, the instructional systems approach can operate effectively.

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"A CASE STUDY OF A TOTALLY INDEPENDENT-STUDY COMMUNITY COLLEGE"

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Introduction

When Oakland Community College (OCC) opened in the fall of 1965, it became one of the 500 to 1,000 similar new institutions which will open its doors in the 1965-75 decade. Fifteen months from the date it was approved, Oakland Community College accepted on two separate campuses a record community college initial enrollment of over 4,000 students. Upon becoming its first employee, the President immediately started recruiting key management personnel and assigned them to work on the specific problems of design and planning of the campuses and the development of the functional requirements for the instructional program.

The Need for Change

The need for innovation in instruction generally, and in higher education in particular, was widely accepted; and any demonstrated achievements could be utilized beyond this one institution. Jerrold R. Zacharias, Chairman of the Panel on Education Research and Development of the President's Science Advisory Committee, in the committee's report stated: "The task of educational research and development is to learn how to provide for all students the education an exceptional teacher provides for a few."

This is the crucial requirement for educational technology and certainly what must occur if the independent and continuing study needs of society are to be met.

Unfortunately, the Zacharias panel did not produce any significant plan for translating the goal of educational research and development into reality: namely, "to provide for all students the education an exceptional teacher provides for a few." At OCC, we believe we have taken a significant step forward in implementing educational innovation.

Design and Planning

The College staff reviewed virtually all recent literature on learning theory and the application of that theory to teaching. Research on class size, space and time utilization and innovations at colleges and universities in instruction were carefully studied. Design specifications for the OCC instructional methodology were derived from the information assembled. The success throughout the country of learning techniques based on individual study was convincing. It was this research and design effort which established OCC as a unique institution.

Instructional Methods: Conventional and Tutorial

The tutorial-laboratory model employed at OCC presents a striking contrast between the methods and techniques of conventional instruction and those of the individual learning proposed by the instructional systems approach. Conventional methods of teaching are basically teacher-oriented or "Open-Loop" instructional systems. The teacher plans and organizes his subject matter presentation in terms of coverage of material in specified units of time; he tells groups of students what he considers to be relevant based on his best "guesstimate", of what is important, and what degree of understanding he wishes to achieve in his students. Little, if any, provision is made for directed and continued student response and correct-answer confirmation as the prime criterion for the design and pacing of instruction. The student usually plays a passive role being neither required nor able to respond and receive correct-answer confirmation at every step in the learning process. There is usually no finite pre-statement of final or terminal performance objectives specifying exactly what the individual student must be able "to know" and "to do" to achieve acceptably. With conventional "Open-Loop" instructional models, the student is evaluated by means of tests which sample the material covered during the instructional sequences. The test questions may or may not be relevant to points of significance required for the concise understanding of principle, concept or application involved.

The instructional systems approach applied at OCC is a learner-centered or a "Closed-Loop" model of instruction. It is a self-adjustive performance system based specifically on the pre-definition of (1) what is to be learned, (2) the required levels of terminal or final proficiency to be achieved by learners and, (3) the most appropriate sequence of instructional steps for learners to insure their success on each progressive step leading to the attainment of the pre-stated terminal performance specifications.

Of critical importance in designing the "Closed-Loop" instructional model, as applied in the tutorial laboratory situation, is the pre-specification of the "critical or optimal learning path." This learning path is limited to "need to know" instructional requirements; to the use of only relevant demonstrations, exercises, etc.; to the reinforcement of concepts to be learned; the sequence and order of presentation of instructional components to be included as integral parts of the instructional sequences; the prescribed role of instructor and student in each instructional setting; and, of great significance, the means for controlling pacing of instruction based on the measured understanding of individual students.

The real measure of validity of such a system lies in its capability to produce the predictable learning achievements designed for the learners in question.

Instructional Methods

In contrast to conventional methods of curriculum planning and instruction in institutions of higher learning, the Oakland Community College designed and implemented instructional methods which are primarily student- or learner-oriented. Courses of instruction have minimized traditional group-teaching applications. Instead, students are provided carefully designed instructional sequences which stress supervised self-directed instruction. Learning is controlled and paced by the individual student, consistent with his abilities to perform successfully.

The model of self-directed learning at Oakland Community College is based on the work of Professor Postlethwait. With the audio-tutorial or tutorial-laboratory model of instruction developed by Dr. Postlethwait, the responsibility for learner achievements rests primarily in the learner himself. Instructional materials, equipment and all other resources required for successful terminal achievements are provided each student in a specially designed study carrel. Self-directed instructional sequences include audio-tapes, visual displays, books, periodicals, laboratory experimental set-ups, programmed materials and manuals among others. Faculty members are always available during self-directed study activities to assist students, as required, in achieving pre-defined knowledge and skill objectives. This "tutorial laboratory" environment enables the student and instructor alike to utilize their respective abilities at maximum capacity. In essence, the method places the responsibility for learning and the mechanics for study time on the student while permitting the instructor to have maximum personal contact with the student on a "need to know" basis. The instructor can more efficiently direct his skills toward orientation and guidance.

Students are provided large group assemblies on a scheduled basis. A skilled "master teacher" uses this time to discuss course objectives, present new developments in the field, point out applications of the subject matter and integrate subject matter with other areas in the pre-designed educational program. Student performance is frequently evaluated by written, performance and/or oral exams as the basis for advancement and to furnish feedback information to the learner.

Implementation and Field Test

In order to insure a properly functioning system, it is most critical for implementing personnel to be fully oriented to their task. At OCC an in-service program covering the following areas was conducted:

(1) System design applications,
(2) Roles of instructors, students and administration,
(3) Student performance evaluation criterion and techniques,
(4) Teaching strategies to meet individual student needs, and
(5) Operational conditions required by the field-test program.

As with any system, it can be expected that individual components will undergo a series of modifications in design. In an instructional system, the means for determining design-change requirements will be based on how well specific instructional materials, sequences, etc., produce the desired terminal learning achievements for which they were designed to produce. Normal practice typically requires several minor modifications in materials in order to insure the highest level of performance predictability. A fair test of all system components for individual courses of instruction at OCC will require a minimum of two years of field testing with a third year required for full-scale implementation.

A System Model must be followed indicating the design, development and system evaluation steps which must occur in the achievement of the operational stage of a "Closed-Loop" instructional system. On completion of these steps, the system designer provides a learning system which will perform with the highest degree of predictability in the achievement of the pre-stated learning objectives for the system. It is the "Closed-Loop" model of instruction which has been implemented at OCC for all courses of instruction applying the audio-tutorial, or independent-study concept.

System-Management Methods and Procedures

Critical to a learner-centered systems approach is the design and implementation of management-organizational principles which can truly accommodate the functions to be performed in the achievement of its objectives. At OCC, a significant departure from conventional systems-management principles and organization was implemented.

The underlying design principle of the OCC management model places major emphasis on instructional-management requirements which are consistent with the learner-centered approach. Major divisions of management responsibility are placed with the offices of Vice-President for Curriculum and Vice-President for Campus Administration. The former office is charged with total responsibility for the design and selection of instructional systems components (materials, people, facilities) which are required to produce the desired learner achievements. The latter office is charged with the responsibility of achieving stated student-terminal-performance specifications by providing independent control for the implementation of the instructional system design completed by the office of Vice-President for Curriculum. Both activities are of equal significance for achieving stated system objectives; and, as such, represent by a process of checks and balances, the necessary controls to assure system integrity.

On completion of the design of an instructional system by the Vice-President for Curriculum, it must be approved by and accepted for implementation by the Vice-President for Campus Adminstration. Once accepted for implementation, total responsibility for system and student performance evaluation will rest with the Vice-President for Campus Administration. Requested modifications in the instructional system, insertions and deletions will be based solely on performance criteria derived in the actual process of operation. Quality assurance in the achievement of learner products becomes the central theme of this systems-management model. The student is paramount in the definition of policies and procedures for total system operation. In turn, the functions performed by system-support groups under a Vice-President for Business, including the offices of Finance, Personnel, Systems, New Facilities and Purchasing, are in every case defined in terms of the achievement of the student-terminal-performance specifications.

OCC Development Commitments (1964-66)

The Board of Trustees at OCC has committed over 20 million dollars for development of four campuses to be in operation in Oakland County by 1970. When fully operational, these sites will serve the needs of over 15,000 junior college students. All campuses will be elements of a single integrated junior college system under one administrative director. The Board has further authorized interim plans for the integration of computer techniques for administrative functions and computer-assisted instructional applications. Integrated television programming between the four-campus complex is also under consideration. Each of the campuses will be modeled after the tutorial-laboratory approach presently in operation at the two existing campuses.

System Planning, Design and Implementation Phases

Under the direction of the President, an extensive planning, design and implementation program was initiated to achieve the present operational posture at OCC. The five major functional requirements to be completed between January, 1965 and June, 1966 are:

1. An Instructional Systems Approach which would coordinate the management efforts of administrators and faculty members.
2. A plan of orientation and training of new faculty members in the use of the Independent Study approach, since no experienced staff existed.
3. The development of instructional materials which would meet the exacting specifications written by the faculty.
4. The design of an inexpensive student study carrel which would have the necessary flexibility for using all modern media.
5. The design and selection of reliable equipment to be used in the carrels.

OCC contracted with Litton Instructional Materials, Inc., Anaheim, California, to provide the following system-management services:

1. Provide a management model which allowed the tutorial-laboratory method to be designed and implemented using the instructional systems approach.
2. Conduct an orientation and training workshop to provide key faculty members with knowledge and skills in planning and developing instructional course designs using the systems approach.
3. Develop Programmed Instructional Packages which meet the OCC specifications developed by the faculty.

Phase I (January, 1965 - June, 1968)

1. Evidence on the successes and failures of students using various approaches to learning, media, teacher and learner time, etc., and other implications for equipment and architecture would be available for dissemination to existing and new institutions.

2. Validated programs would be available for the use of other educational groups. There are significant costs of designing, writing, testing, revising and evaluating various media and it seems unnecessary for others to duplicate this effort--even if they had the desire and financial resources.

3. A large group of faculty in the many academic disciplines and numerous technical fields would be trained in the development of effective learning materials using a multi-media approach. This could provide the basis for the immediate development of Phase II materials for national junior college curricula.

4. Computer-assisted instruction. CAI is possible and awaits the training of a large group of subject matter specialists and the availability of a substantial number of programs. OCC provides the first opportunity to implement CAI where extensive software was developed prior to the purchase of a computer.

Phase II (1968 - 1970)

By July 1, 1968, Oakland Community College will be able to demonstrate objectively the effectiveness of the tutorial-laboratory approach in a full operational junior college. Beginning September, 1967, a third campus, especially designed for the tutorial-laboratory self-directed approach will be opened for operation at a cost of 13.7 million dollars. During 1968, therefore, instructional systems field tested during 1966-67 will be implemented in a physical facility especially designed for their applications. Validated instructional system course designs and instructional components integral to these designs will be available for dissemination to other junior colleges in academic and technology courses. Cost effectiveness criteria in all operational phases will be derived. A validated system-management process specific to a learner-centered systems approach will be available for dissemination to other junior colleges. A variety of student performance indices will be provided relating to the effectiveness of alternate method-media combinations for academic and technical training objectives.

These accomplishments will provide the empirical criteria and necessary resources to extend the OCC operation to a computer-assisted instructional environment. Recent recommendations for the development of this computer capability were postulated at the U.S. Office of Education symposium held at the University of California, Irvine, California, November, 1965. It was specified that the OCC-type of facility would be best suited to long-range community needs. The development of extensive learner-centered instructional materials for OCC in Phase I in conjunction with the large OCC faculty capability to produce further materials will provide a unique operational testing capability for computer-assisted instructional applications in the junior college setting.

"AN AUDIO-TUTORIAL APPROACH TO TEACHING BOTANY"

S. N. Postlethwait
Purdue University

I would like to divide my talk into four parts: First, I will discuss the history of the audio-tutorial system; second, I will show you a film of scenes from our learning center; third, I will discuss the audio-tutorial system as we currently operate and some of the results; and fourth, I wish to summarize with some of the educational concepts which have emerged as a result of our experience.

1. The audio-tutorial system began approximately five years ago as an attempt to make some adjustment for the diversity of backgrounds of students in a freshman botany course. The course involved 380 students and was a four-hour credit course. It mainly served freshman students in the Schools of Pharmacy and Agriculture. These students have attended a great variety of kinds of high schools so that some had received excellent training and others relatively poor training. Students with equal capacities could not perform equally well because of this difference in background. To assist the students with poor background, it was decided to make a special lecture on tape each week and file this tape with the language tapes in the Audio-Visual Library. Students who wanted could go to this facility and hear the supplementary lectures and thus enable them to compete more effectively. During the course of preparation of these lectures, it occurred to me that the student might well bring their text book along and open it to the appropriate pages so that the subject matter in the text could be related to the subject matter covered by the tape lecture. Later it seemed logical to add the use of their laboratory manual in

the same pattern so that the subject matter in the laboratory manual could be related to the subject matter in the text and to the subject matter on tape. Still later, it seemed feasible to provide the student with plants and experimental materials so that these too could be related to the laboratory manual, text book and tape lecture. Ultimately the discussion on the tape was no longer a lecture, but rather it was a discussion on a one-to-one basis, one teacher-one student, in which I was tutoring the student through a sequence of learning events. The tape was prepared by arranging the various items which I felt would contribute to the student's learning on a table before me and talking into the tape player as if I were visiting with a friend and helping him study. Learning events included a great range of experiences such as reading from the text, doing an experiment, collecting data, analyzing data, manipulation of a microscope, watching a time-lapse movie, observing plant specimens, charts, diagrams, photographs, and listening to brief lectures or discussions as appropriate. The success of the initial tapes encouraged me to run an experiment of 36 students for one semester which further confirmed the potential of the audio-tutorial system. At the end of the second semester of experimentation, I met with these students to restructure the botany course, disregarding all traditional limitation and placing total emphasis on student learning. All busywork would be eliminated, and an attempt would be made to adapt the method of presentation to the nature of the objective. The first restructured course included the following study sessions.

One hour per week - General Assembly Session (GAS); 1 hour per week - Small Assembly Session (SAS); and ? hours per week - Independent Study Session. The Independent Study Session was the modification of the original audio-taped tutorial. The ingredients of the course perhaps will be best communicated to you through the use of a movie film showing scenes from our classroom. This film follows the activities of a student through one week's work. I would emphasize at this point that several changes have been made since the film was produced. These changes were based on our experience and constant brainstorming with teaching assistants and students; however, the basic outline provides a good background for the remainder of my discussion. At one point in the film where the student is asked to use an 8 mm Technicolor projector, there will be spliced in some work prints of the kinds of learning events we would expect to be presented through the single-loop film medium. I will show you the film now and discuss some changes we have made immediately after the viewing. Let us now go to the film.

2. SHOW FILM - "A Multi-Faceted Approach to Teaching Botany"

3. I am stopping the film before it discusses the Small Assembly Session, because we have made several changes in this session and I don't want to take up time with the outdated information. Two Sessions we have already discussed: the Independent Study Session, which remains the same except for some minor changes such as the increased use of 8 mm film and improved arrangements of furniture in the learning center; and the General Assembly Session, which was discussed on film, also remains essentially the same.

An Integrated Quiz Session (IQS) has been substituted for the Small Assembly Session. The IQS is a modified seminar and oral quiz. It involves eight students seated informally around a table with one instructor. The instructor is supplied with the various items which were included in the learning center the preceding week, and these items are used as a basis for student discussion. All students are asked to discuss items in their turn and are asked to do so in a specified pattern or format. First, the item is to be identified; secondly, the student is to tell its role in the week's work or objectives; and thirdly, the student is to explain how it fulfills this role. These items include a great variety of materials such as plant specimens, a microscope, 2 x 2 slides, diagram or chart, a time-lapse movie, all or parts of experimental equipment, or any other materials which have been used as a subject of study during the proceeding week. The student's performance is evaluated immediately on the basis of 0-10 points. If the instructor is much impressed, the student is placed in the category of excellent and receives a score of 9. If the instructor is not impressed, the student is placed in the category of mediocre and receives a score of 7. If the instructor is depressed, the student is placed in the category of poor and receives a score of 5 or less. Six is a passing score, and all scores are subject to change as the discussion continues. Each student has an opportunity to add comments concerning any item which he thinks may enlighten the group. The instructor will then raise his score as seems to be approporiate. The items are distributed to the students in a sequenced fashion so that the theme or themes of the week are clarified, and where experiments lead progressively from experiment "A" to experiment "B" to experiment "C,"etc., this progressive relationship is retained during the session. This session has been an effective feedback mechanism for informing us of the success or failure of any program sequence of experiments and often provides clues for improving our approach. It also helps to clarify the appropriateness of the communication vehicle used in attempting to achieve the objective. It turns into a miniaturized seminar and thus enables many students to see relationships and concepts which were not evident from the Independent Study Session earlier. The IQS is also an effective tool for preventing procrastination on the part of the students.

Two questions most commonly asked concerning the system are as follows: 1. Have we not now eliminated the personal contact important for motivation? 2. Is this not now a "spoon-fed" type operation in which there is no opportunity for student discovery or inquiry? The answer to the first question concerning personal contact is that we find personal contact is actually enhanced. We now have relegated much of the routine of teaching to a meaningful personal contact. The opportunities for personal contact are as follows:

1. As in the conventional lecture system, the senior instructor is available at the General Assembly Session for this kind of personal contact such as it is.
2. In the Independent Study Session an instructor is available to give direct attention to individual needs on a one-to-one basis for any problem requiring instructor assistance. Also in this session students may visit with instructors about any additional aspects of the subject matter which they find interesting.
3. The IQS provides an opportunity for every student to become well known by at least one instructor in the course, and every student to know at least one instructor very well. Additional opportunity is available for every student to know many instructors well, but there is no alternative but to become well acquainted with at least one instructor.

The second question concerning inquiry is also answered in the affirmative. First, may I define levels of inquiry. Inquiry occurs at various levels with the maximum or first level of inquiry represented by research. The second level of inquiry is the type of experimentation which can be completed in the span of a three-hour laboratory. The third level of inquiry is one in which the busywork of doing the experimentation is completed by the instructor, and the student is asked to collect data from the results and analyze these data. The fourth level of inquiry is to provide the student with data and ask the student to analyze these data. The fifth, of course, would not be considered real inquiry but merely a demonstration. All of these levels of inquiry are feasible under the audio-tutorial system. At the first level of inquiry, our students are asked to do two miniature research projects, the first of which we provide guidance throughout the project and the second is left totally to the initiative of the student. In the first project the problem is defined, the materials and methods are described, the student is told what data to collect and asked to analyze these data and write up the project in the format of a scientific paper. The second project is completed by those students who hope to make an "A" in the course, and here the student is restricted only by the materials available to him. He defines the problem, decides on the experimental procedure, what data to collect, analyzes these data, and writes up his project in the form of a scientific paper.

At the second level of inquiry, a problem is defined for an experiment requiring two to four hours and is done in the ISS as well under the audio-tutorial as under the conventional system. The subsequent levels of inquiry are also handled effectively in the ISS. The results of the A-T system have been positive from every point of view. Better instruction can be given with equal or less staff and space. Grades and student interest have improved at all levels. Costs are reduced for equivalent levels of instruction.

4. Now may I take a few moments to discuss the philosophy of the audio-tutorial system as I see it in retrospect after five years of experience. It is sometimes said that "teaching is an art." This may be true; however, "education" should be a "science." The scientific method demands that one begin by defining the problem first. The "problem" in education, simply stated, is "learning must be done by the learner." While this is not a very profound observation, it stands to reason that if "learning is done by the learner," the educational system should provide activities which require student involvement. Both teacher and student alike should be concerned with the kinds of activities and situations which contribute to learning. If these activities and situations can be identified, the teacher is obligated to provide a course structure which will permit the student to engage in these activities, and the student is obligated to perform them conscientiously. I would like to list some of these activities and situations as I see them.

1. Repetition - There is little question but that the nature of many objectives require repetition for their achievement. However, repetition ought to be engaged in an intelligent fashion and not adapted to the individual needs of a particular student. For example, a student who has learned about the Krebs cycle in high school biology has little need for extensive repetition of this study in a college biology course. On the other hand, a

student who is encountering the Krebs cycle in his college biology course for the first time may find it necessary to repeat this study or certain portions of it, a great many times. In a course with 500 students the teacher cannot possibly make the adjustments in repetition for individual student needs. Only the student can determine intelligently how much repetition is necessary.

2. Concentration - Most classrooms are not organized to permit students to concentrate during their study. Students are distracting to one another, and other disassociated events which may be occurring tend to divert the student's attention from the subject at hand. The audio-tutorial system permits the student to isolate himself from the surrounding environment through the covering of his ears with the earphones and the use of booths to reduce his awareness of his surroundings.

3. Association - In a study of plant science the major objective is to learn about plants. It makes sense therefore, that a study of plants should be conducted where plants are available for observation. Diagrams, charts, models, photographs, and other such devices should be a "means to the end" that students' attention is directed to the literal plant itself. The audio-tutorial system provides an opportunity for the student to have a plant available at the time he reads about it, does experiments, etc.

4. Appropriate-sized units of subject matter - People vary considerably in the amount of subject matter that can be grasped in a given amount of time. Programmers have demonstrated that most

people can learn almost anything, if it is broken into small enough units and the student can take time to become informed about each unit before proceeding to the next. Any program of study, therefore, should provide each student an opportunity to adjust the size of the unit to his own ability to assimilate the information; those who can absorb large quantities of information should be able to do so in an unrestricted fashion, whereas the course structure should present others who must proceed more slowly with an opportunity to do so. The audio-tutorial system allows the student to proceed at his own pace and to break the subject matter into units commensurate with his ability. This is especially important where the learning events are sequenced with subsequent events dependent on a mastery of proceeding ones. The human mind with its limited attention span frequently is distracted during the presentation. If this distraction coincides with a point which is particularly critical to subsequent units of information, when the subsequent units are presented the student's deficiency may frustrate the learning experience. Presentation of material over a long span of time may result in progressively increased frustration such that the student assumes the attitude that the subject matter is too difficult for him. In order to maintain status with his peers, he may develop an attitude of "I don't want to learn this material" simply as a defense mechanism. Experiences such as this throughout several years of exposure to formal education may cause many educable people to develop mental blocks which are difficult to overcome.

The same information presented to the same student in a setting where the student can make each foundation idea firm before proceeding to the next can result in successful learning. "Success begets success," and successful experiences will tend to encourage the student to greater achievement. The educator could well afford to learn from a successful construction engineer who pours a concrete foundation, carefully shaped and positioned to support the future structure, and then permits this foundation adequate time to become fixed or firmed before placing on it the subsequent materials. Bricks and mortar are laid alternately with each brick and measure of mortar carefully placed to provide a bed for the positioning of the next bricks to be laid. Only in education do we pour forth the units of subject matter along with the cementing materials at a fixed rate, mixing together the bricks and mortars without regard to the many other factors which may affect the resultant organization.

5. Adapt the nature of the communication vehicle to the nature of the objective. Botany is a "complex" of subject matter and requires a great variety of learning experiences. These may include the handling of a plant specimen, watching a time-lapse film, viewing photographs, reading from text books and _Scientific American_ articles, listening to a discussion by the senior instructor, visiting with colleagues, etc. It is logical then that no single vehicle such as lecturing or a text book can achieve the full spectrum of objectives for this complex subject. The student's experiences should not be confined to any particular

vehicle such as 8 mm film, audio tape, text book, or any other of the great variety of communication devices which are now available to us. In cases where the development of a procedural skill is necessary, there is no substitute for the student doing this procedure himself. A properly structured course, therefore, would carefully define objectives and not try to mold objectives to fit a favorite medium (lecture, for example), but instead would use the medium best adapted to the nature of the objective. The audio-tutorial system permits this kind of student participation and enables one to bring to bear the correct medium commensurate with the objective.

6. The use of multi-media - Individuals differ in their responsiveness to different kinds of communication devices. Some people learn well through reading, some can learn best by auditory communication, and others can learn best by literally handling specimens and doing experimentation. While some of my colleagues think that intellectual achievement is accomplished only through reading, it is my opinion that many poor readers are as intelligent as good readers, and they may literally become more knowledgeable than good readers if they are permitted exposure to subject matter through a communication vehicle more suited to their receptiveness. The audio-tutorial system thus provides an opportunity for subject matter to be covered in a great variety of ways, with the student exploiting that medium which communicates most directly and effectively for him.
7. Finally, and most important of the learning activities and

situations - The significance of integrating learning events was brought abruptly to our attention by an accidental positioning of two experiments. Subject matter from experiment "A" was necessary for understanding the subject matter of experiment "B." For a number of semesters the students had had little or no difficulty of transferring information from experiment "A" to experiment "B." One semester, however, I noticed that more students were having difficulty with this transfer of information. In tracing the possible causes for the difficulty, it was discovered that during the preceding semesters experiment "A" and experiment "B" had been sitting in close proximity. Some new materials inserted in the course had forced the placing of experiment "B" on the opposite side of a demonstration table from experiment "A." Although this distance was a little more than three feet, the disassociation in space resulted in fewer students being able to transfer information from experiment "A" to experiment "B." It stands to reason then that if this disassociation is extended in space by an even greater distance, still fewer students will be able to make the transfer of information. One can extrapolate further and assume that if the disassociation is not only in space but in time as well, still fewer students will be able to transfer the information. While the proximity of positions of materials is not a very intellectual challenge to a teacher, this experience has served to emphasize to us that many of the students' problems are not caused by the difficulty of subject matter, but rather by relatively simple factors.

It stands to reason that if learning events are to be complementary and to have some relationship, they should be brought into close proximity and properly sequenced. The conventional structuring of a lecture, recitation and laboratory does not take this into consideration, but rather it may expose a student on Monday to a lecture concerning a given subject; perhaps on Wednesday the student does experiments related to that subject; on Friday a recitation will involve the student in some exposure to the subject; and then on Sunday night, late, the student may read on this subject from his text. The audio-tutorial system permits the student to bring all of these learning experiences into an integrated sequence so that each learning event may enhance or complement the adjacent ones and thus result in a synergistic effect. One might compare this analogously to an orchestra. Many musical instruments making sounds in a random fashion result in noise or cacophony; however, these same sounds, if given timing and placed in an appropriate sequence or relationship one to another, form a melody. I am suggesting that there is a melody of learning, and that teaching is, indeed, an art. It is the art of sequencing learning events into a meaningful experience for students.

Education is a science in that one must define the problem first and then go about logically developing a procedure which permits a student to engage in those activities which result in learning. It may require a total restructuring of courses and reorganization of approaches. Teaching is an art; but the artistry comes not through the use of the teacher as a communication device, but rather it comes in his skill in determining objectives and developing the materials and sequences which will enable the students to achieve those objectives in the most efficient and effective manner. Many of us find this approach to education a little difficult. Teachers and educators are the most tradition-bound group of individuals I know. This happened in a logical evolutionary sequence, the explanation of which is relatively simple. In the days of Aristotle the source of information was the scholar, and he was the communication vehicle. It was logical that contact between the student and the educator was through lecturing. It is amazing that many of us still teach in this fashion, feeling that our contribution is to expose to the student our knowledge of the subject matter. Many people who want to become teachers do this merely because the lecture is an ego-inflating device; we find it an exhilarating experience to stand before 500 people and to mystify them with our great knowledge of a given subject. In this age there are many communication devices more effective than the human being, and ego-inflation of scholars in not a worthy objective for an educational system. We lost sight of the basic purpose of education a long time ago. When the situation was such that there was one teacher and one student, the teacher focused on the individual needs of that particular student; but when the teacher had two students, the focus was changed then to the needs of the teacher, and the two students must then assemble at the convenience of the teacher. When the situation expanded to involve so many students that two teachers were necessary, one teacher then became senior; and a new group of individuals with individual problems was evolved, the administration. It is logical that for administration one would select the most aggressive and most skillful individual at problem solving. It is logical also that such an individual would solve the problems which were close at hand. During the years divergent evolution has occurred to produce a community of individuals who are concerned with problems of constructing buildings, obtaining funds, etc., and learning problems are given lower priority. With our administrators preoccupied with these problems, only lip service is given to such mundane things as the proximity of experiment "A" and experiment "B." Such small, insignificant items are cast aside in favor of the more challenging and interesting activities associated with the vast numbers of students and big time education. I would like to cite just one example in support of my position. A certain university begins its semester with the first classes meeting at 11:30 A.M. on Wednesday. I challenge educators at that institution and at any other institution to show me a course for which good pedagogy dictates 11:30 on Wednesday as the appropriate time to begin the semester. I know of many courses, multiple-section courses, for which this timing clearly is a disadvantage. Multiple-sectioned courses which meet on Monday, Wednesday and Friday will have some sections which will have been exposed on Wednesday afternoon, Friday afternoon and other sections which will have been exposed only on Friday so that the subsequent week's work will be totally out of synchrony. As a result both instructors and students recognize the impossibility and impracticability of this situation so that students do not show up on Wednesday afternoon, and if they did they would find a sign on the door saying, "No class today." For all practical purposes, it is impossible to start course work until Monday morning of the subsequent week.

Now I ask you if good pedagogy does not dictate that classes begin at 11:30 on Wednesday, what criterion then is used to establish the starting time? The answer is simply that this is an administrative convenience, and that administrative convenience is taking precedence over sound pedagogical procedure. This is merely one example, and if time permitted I could cite you many more.

One more thought. It was suggested to me that if one wishes to attract outstanding faculty to a University today, it is necessary to provide ideal teaching conditions. I should like to analyze this statement for you. What is meant by outstanding faculty? Outstanding faculty on most campuses are Nobel prize winners or those which have demonstrated competence in research activities. Secondly, what is meant by ideal teaching conditions? The answer is few hours in the classroom and highly selected students who will learn in spite of the instructor. It is a truth that we have come to the point where instructors consider it a promotion when they are given the best students in the university or high school. I am suggesting to you that this is not a professional attitude. What would you think of a doctor who wished to take only those cases which could be cured by merely dispensing aspirin? Most of us would say that this is nonprofessional, and we would not want a doctor of this kind. We want a doctor who would like to concern himself with the hard-to-get-well cases and those cases which are challenging. If this be true, and teaching is a profession, a professional attitude would demand that we too would find the hard-to-get-well cases most challenging. Humbling as it may be, self-examination may be in order for us to determine whether we really and truly fulfill our role in the educational process. Are we succumbing to the subject matter, or are we willing to accept that it is our responsibility to provide the facilities, provide the guidance and direction, and provide motivation to help students learn. Let us be honest with ourselves and true to our commitment.

Thank you very much.

"HOW TO PREPARE AN AUDIO-TUTORIAL LESSON"

S. N. Postlethwait
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One of the advantages of the audio-tutorial system is that it forces the instructor to evaluate his procedures and to reconsider his objectives. It is a common fault of many of us to spend little time in the careful planning of the presentation of a course. We do many things with limited preparation and depend on our earlier experience of teaching the subject to cause us to do and say the right things at the right time. Most of us are resistent to change and sometimes we cling to ideas which have outlived their usefulness, thereby handicapping the kind of progress we should be making.

The following steps are suggested as a procedure for the development of an audio-tutorial lesson.

Step 1. List all of the objectives of the unit. By this it is meant that the teacher should list as carefully as possible each achievement which he expects the student to accomplish, keeping in mind the level or degree to which the students should attain. The list should include skills, concepts, vocabulary building, problem solving, creative activities, etc.

Step 2. List all of the available media and teaching aids which might be useful in accomplishing the above objectives. These include: paragraphs to be read from the text and periodicals, exercises to be completed from a manual, specimens to be observed or examined, experiments to be completed, homework problems to be worked, films to be viewed, and the many other items that might be useful in this regard.

Step 3. Select the media adapted to the subject. List alongside the items to be accomplished, the method through which they can best be done. Some items might be included in the general assembly session, some in a small assembly session, some on the tape (programmed by tape), and on film or in the home study session.

Step 4. List the study activities in their proper sequence. Consider carefully those items which can be used as a foundation for subsequent ones and align each item in a properly programmed sequence.

Step 5. Assemble the materials to be programmed by the audio tape. With these materials and a tape recorder, a trial tape should be made. Perhaps it would be useful to have a student helper do each item and the instructor record his voice as he directs the activities of the student through the entire audio-taped program. If the student helper is an average student, his questions should be very useful in determining what points need to be elaborated and what items can be reduced or eliminated. Further, this approach should give the tape a tutorial flavor which would cause each student to feel the instructor was talking directly to him.

Step 6. Have the audio tape transcribed and edited critically. This step should enable the instructor to make sure the words he uses express precisely the information he wishes to present and to eliminate much of the redundancy which occurs in ordinary conversation.

Step 7. Make the final tape. It is probably better for most of us to make a final tape from a manuscript which has been edited and been typed in capital letters. Emphasis markings and other helps can be entered at the discretion of the instructor. Hopefully the tape would be produced in a conversational tone as if the instructor were speaking to only one student.

In some cases it may help to have a student as an audience during the final taping of the lesson. Ad-libbing and background noises may result in lower quality tape; however, if they are not too distracting, they might contribute to the naturalness of the presentation. The authors have done no experimentation in this regard, but feel that the most straightforward presentation is probably the most effective and efficient. Interruptions to break up the monotony of listening to the tape will most likely come in the form of the performance of experiments, observations, demonstrations, reading from the text or laboratory manual, and other study activities. It has been the practice of the authors to retain the master tape on file to be used only in the production of additional tapes. The Audio-Visual Department at Purdue University is equipped to produce three tapes from one master at a very rapid rate through the use of relatively inexpensive student labor.

"INNOVATION AT THE JUNIOR COLLEGE DISTRICT"

Glynn E. Clark
Campus Director - Meramec Community College
St. Louis Junior College District

It is an honor to be here and share with you some of the things that we are doing in St. Louis. George Hall was kind enough to ask me to describe certain of the instructional techniques we are using in St. Louis. I shall speak as the Director of the Meramec campus and not as Vice-President of our multi-campus District, although I will use illustrations, as my colleagues would want me to, of things that are happening on the other campuses. Indeed, several of the techniques which I shall mention are techniques developed on our other campuses, and I do not wish to imply that they were developed at Meramec.

It is disconcerting for some of us who have been in education for many years to see how little improvement we have made in the teaching and learning process as compared with the rapid and striking improvements in technology as applied in science, medicine, business and industry of the space age. I don't know how you people feel, but occasionally I feel a little frustrated to think that after all these years in education I personally have not learned more ways of doing things more effectively. I didn't take notes this morning on Bob Branson's talk on the systems approach to teaching, because I have had the pleasure of visiting with him and seeing his operation. His is certainly an intriguing approach to teaching.

I think as we look at ourselves compared with our colleagues in industry, we have to conclude that we do precious little in terms of research and analysis directed at doing a more effective job. I think all of you would agree that we don't begin to invest in research to the extent that industry does. Most of the experiments in education, present company excluded, have been rather timid ventures financed with someone else's money. We will experiment all along the line if somebody will pay the bills! We educators have not interpreted to our communities that fact that we must spend local money if we want to achieve some of the breakthroughs of industry and science. Sometimes we take a look at our efforts and say, "This is where I came in - this sounds like educational psychology in the mid-thirties," but hopefully it isn't. We tend to say, "After all, the human being is so complex that we really can't do much about adjusting to this challenging job - we simply have to go along with what good teachers know." Then, of course, the real excuse is to conclude: "Teaching is an art - you can't tinker with it; you must find the good teacher and accept whatever he does."

Some say teaching is really not subject to orderly improvement. Others say that man is quite old, and teaching goes back to the time when humans first had offspring; hence, we have reached a plateau, and there isn't much more we can learn about teaching. We can't break through; let's not fight it! Administrators sometimes are prone to spend their time on buildings, books, paper work, etc. and not concern themselves with the techniques of teaching, "because everything has been learned that's ever going to be learned about how to teach." Obviously you people do not believe this or you would not hold the jobs you do. Certainly, I don't think that we've reached an endless plateau in our knowledge of effective teaching.

In junior colleges, if we assume that there are better techniques of helping students learn, and I certainly believe there are, how can we best develop such techniques? If innovations are needed, and we must agree that they are needed, how do we innovate? Where do we get the motivation and the creative ideas?

The junior colleges have not spawned many exciting ideas in instruction, or so it would seem from the publications concerning innovation. At least if we develop innovations, we have not published much about them. Perhaps we have all kinds of new approaches to teaching and learning that have not been publicized.

New Media in Higher Education, published by the Division of Audio-Visual Instruction of the AHE and NEA in 1963, reports the findings of 90 undertakings which were considered important applications of new media in 40 colleges and universities. Of these topics, two of them were identified with junior colleges. One was the Chicago T.V. Study, which I think was paid for with foundation money. The other was the learning resources devices at Stephens College. (I think Stephens College has had its share of grants and is moving toward a full four-year program.) Otherwise, junior colleges are not listed in this publication. Hopefully, the next time around some of us will be. I was also interested in B. Lamar Johnson's article, "Needed, An Experimental College," from the October, 1965 Junior College Journal. He said that there is no outstanding experimental school among junior colleges. Of course, this was before the experimental approach of Oakland Community College. Johnson says that there should be vice-presidents in charge of heresy. Johnson, in the same article, quotes Ed Gleazer, who said at the National Conference on New Directions for Instruction in the Junior Colleges, held at the University of California at Los Angeles in July, 1964, "It is my impression that your colleges in general have tended to stay well within the boundaries of current educational practice and procedure. Frequently described as flexible, dynamic, new and responsive, the junior college does not often actually fit that description."

As a conservative thought, before we take off and say that we must innovate, it might be healthy to ask you to review the list of schools which you consider outstanding and ask yourself what made them outstanding. Is it an index of innovation, or is it a more complicated index? I have a hunch it is much more complicated. For example, I have a high regard for the University of Michigan. There are many factors which indirectly cause me to regard it highly. Yet, I don't know why Michigan is a great university. Perhaps factors such as staff, money for research, selectivity of students and the distinguished record of graduates result in my informal evaluation. The University of Wisconsin, at least in my opinion, has a good history department. Why? I don't know. Perhaps some of you who are closer know. Before we put all of our eggs in the innovation basket, I think we ought to ask, "How did the outstanding schools become outstanding, and would these same factors apply to a comprehensive community college?"

What I am saying is that in discussing innovations I want to make it clear that there is far more to building a sound educational program than simply doing things differently.

Some Assumptions Concerning the Improvement of Instruction:

I would like to venture a few assumptions germane to the general problem of improving instruction, which I hope are valid:

A. Instruction and learning can and must be greatly and promptly improved. I don't believe that the plateau has us whipped!

B. Greater productivity on the part of faculty members must be sought. If we're going to do the job and pay the bills, I think we need to look at increased productivity on the part of the faculty members.

C. The present methods do not seem to provide complete and adequate routes to improvement. I haven't seen anything that I think will take us all the way, at least not as far as I hope that we can go in the next ten years.

D. New approaches to our tasks must be stimulated if we are to face up to our role as administrators. Somehow, as administrators, we must be able to motivate instructors to seek a better way of stimulating learning.

The Improvement of Instruction

How can we foster improved learning? I would say broadly and generally there are two ways that we might foster innovation and improvement in learning. The first is one that I alluded to earlier - Lamar Johnson's idea of having an experimental institution that would develop a rationale - develop a bold, creative plan. This, in essence, I think, is what Jack Tirrell has done. After determining a promising and experimental approach, the administrator proceeds to implement the first method by selecting and employing teachers who are ready, willing and able to carry out the plan of the institution. A second, general route would be that the administrator, in every way possible, simply encourages, emphasizes and recognizes excellent teaching, wherever it is and however it is done. The latter approach can foster experimentation, not only in every department, but perhaps on the part of every member of every department.

I think we must weigh and balance the fact that students are people, and we should not make guinea pigs of them anymore than we need to in order to get the job done. Hopefully, our innovations would also be weighed in terms of morale, self-concept, and ego involvement of our students - all these factors that are important for the success of young people.

The JCD Uses a Diversified Approach

Obviously, the Junior College District of St. Louis - St. Louis County follows the latter method. We encourage, emphasize and recognize excellent teaching and innovation, and we start doing this as we recruit our faculty. We simply look for the best young teachers we can find - people who are energetic, able and eager to help build a new institution. We seek people who will, at least verbally, indicate a willingness to try new methods and don't feel that they must teach the same way they were taught. We try to select people who are aware that teaching is merely a means to stimulate and motivate the learning of students. We concentrate on the good graduate schools and try to choose a goodly number of instructors who have just finished their Master's degrees in their teaching fields, and we balance this with a reasonable number of highly regarded, experienced instructors. We are favored in that Missouri does not require a teaching certificate. Thus, without a credential problem, we can bring in promising people and immediately certify them, provided they have a Master's in their teaching field. Then we select, retain, promote and give merit increases to people on the basis of effective teaching. We say this is important; so we have to put our money where our mouth is. We visit classes - the deans, the division chairmen and campus directors visit classes - to evaluate the teaching situation and give written reports to the instructors and hold conferences to discuss the evaluations. An annual estimate of performance on the part of teachers is made and utilized in retention and promotion. Obviously, to obtain and retain effective teachers, a competitive salary schedule is necessary. We have been fortunate in establishing and maintaining a good salary schedule. When we look for junior administrators, we look for the same general characteristics except at the administrative level - able people primarily interested in the teaching and learning process who can assist faculty members in developing sound programs of instruction. We have three Kellogg graduates who are doing very good administrative work for us, and I've already lost two able young men to fellowship programs. We will probably lose others each year to similar professional advancement, but we're happy that this can be done. The administrators generally are oriented toward the concept that teaching is important and that there must be better ways to do it.

The board of trustees of a community college is a powerful force in determining the educational climate of the institution. We have been fortunate to have six very dedicated people, who are bright, able, and who are deeply interested in the instructional program. They, the President of the District, the campus directors, everyone down through the divisional chairmen; all, are keenly aware that our bread and butter is effective classroom teaching - no one certain way, but effective, stimulating classroom teaching. One way in which the Board of Trustees and the President of the District show their interest in the teaching process - and innovation - is through a systematic public information service. Much of the instructional activity of faculty members will not hit the big daily papers, but within the campus network, news releases are cranked out and disseminated to every faculty member on every campus. If a faculty member is doing something unique at Florissant Valley, the faculty at Meramec and Forest Park will hear about it in an inter-campus news release. We invite selected faculty members once a month to report on their projects to our Board of Trustees.

They explain to the Board what they're doing and why they're doing it. President Cosand has been proud of the performance of the faculty members and delighted with the great interest shown by the Board.

In our situation we are using a multi-pronged approach to the improvement of instruction. We plan to try any reasonable hunch that any teacher has, and I'll describe briefly how we try to put this into operation.

We believe that there is no royal road to excellent teaching and that our most promising approach is to encourage and stimulate faculty members to experiment and develop their own best techniques in the light of their strengths and interests.

I have indicated that we make every effort to recognize and identify instructional innovations that show promise. May I point out some problems in doing this. If you begin to recognize teachers who are making innovations, if you feature these people, if no other faculty members are recognized for their important contributions, you may have some problems with the 85 to 90 percent of your good, capable journeymen teachers who are carrying the big class loads in social science, sociology, mathematics, etc. There is a danger of playing up the experimenters too much and thereby hurting faculty morale. This is something you must consider carefully, and I'm sure that you are aware of this. We make it a point to recognize all good teaching in one way or another through the methods I've mentioned. We deliberately attempt to see that the orthodox, conventional teachers who are doing a good job have their place in the sun, because we think they are the "bread and butter" people for us. We are grateful for any good teaching whether it be an innovation or not. I'm not sure I'd want to work with faculty that would let me tell them how to teach or thought they must all be innovators. I think I would not care to be associated too long with a group of people who said, "You tell me how and I'll do it." Certainly in St. Louis, our people argue with everyone including campus directors and the President. (This is salary time and they've been arguing with me.) I've never seen so much willingness of people to come in and say their piece. A few will look you right in the eye and tell you how good they are. I suppose this might be one of the signs of the times.

I think we must be aware that not only do we have to reward our journeymen, our consistently productive teachers, but we must protect the innovators. I'll bet Sam Postlethwait acquired a few lumps on his head when he started his program over at Purdue. Anytime someone innovates, he risks having the wolves at his heels. In stressing innovations, we walk a delicate line to avoid a negative reaction on the part of other faculty members toward the fair-haired innovators. We try to make it clear that innovations are not a threat to more conventional instructors, and we discourage strongly any petty sniping or jealousies. We encourage the attitude that as a rather new institution we are free to experiment and to develop physical facilities to support demonstrated improvements in teaching techniques. If someone has an idea, let him try it out and don't pre-judge the results. These are just the A, B, C's of administration, and we give thoughtful consideration to these points.

One adminstrative practice of great promise, in my opinion, is the provision for what we call released time projects. We feel that we need to subsidize faculty members to experiment with instructional devices and techniques. During the school year, for example, someone might be teaching 9 hours instead of 15 hours, and thereby be "released" to conduct approved action research projects which this person had planned and recommended. He will be expected to publish the project for distribution to all the campuses. Such "released time" projects have produced results which we think have significantly improved teaching and learning. (I will show you examples of these on slides in a few minutes.) Presently, most of this work is authorized in the summer. A teacher might request 6 credit hours of release time or an extended contract for which he is paid as though he taught 6 credit hours. Within the limitations I mentioned, he can then experiment and produce something which may or may not appeal to his colleagues the next session. We spend money on this - our budgets for each campus are set up for next year with roughly 2 percent of professional salaries on each campus going into this action research. In addition, the President of the District has about $55,000 in a development fund to expend on promising projects over and above those approved by the campus directors. In approving and financing faculty research projects related to the improvement of instruction and learning, we are not naive enough to think that any little thing that one of our instructors develops will revolutionize his department, his division or the college. It is our hope, however, that his "research" will improve his teaching and the learning and motivation of his students.

If I tend to become too enthusiastic about any one approach to teaching as the final answer to our problems I need only to think back to the various techniques, movements and systems that were believed by some to be the answer: e.g., the psychologists (the behaviorists and the gestalters) were going to get all this straightened out so that we would understand teaching and learning. Then sound movies were going to save us by bringing master teachers to all students. Then came T. V. education. For a while it appeared that this was all we needed - closed circuit T. V. and broadcast T. V. Then the overhead projector was going to do much of the work for teachers. Recently teaching machines, programmed instruction and computers have impressed many of us. Honors courses and other grouping plans were another approach - which has not completely solved our instructional problems.

Temporary Buildings used to try out Experimental Approaches

In our temporary buildings we are experimenting with techniques in instruction and equipment in laboratories. We have a $47,200,000 bond issue that was just passed. This is quite a responsibility: for example, how should you build your permanent laboratories? Teaching techniques are changing so much that we're rather reluctant to jump in and build our labs until we try out certain "open laboratory" methods. Our District bought three campus sites. On two of them, where we have the room, we immediately put up temporary buildings. These temporary buildings of some 40-50,000 square feet will be the proving ground for most of our lab techniques. This is where we are experimenting with projects in audio-tutorial biology. We're hoping that we can move into our permanent buildings with some degree of confidence that at least the laboratories, classrooms and lecture halls will fit instructional patterns we're going to be using 5, 10, or 15 years from now. This means the faculty must experiment and draw certain conclusions promptly.

Foundation Grants as an Approach to Instructional Innovations

The Junior College District has indicated its interest in experimentation by submitting several proposals for foundation grants. Three sizable proposals have been funded and have encouraged faculty members and administrators to give much attention to new ways of stimulating teaching and learning. At our state of development most of our research grants are the result of administrative leadership, although teachers were involved considerably. The first of these grants is the general education program. Our mid-city campus is much concerned about the people who are not ready for regular collegiate-level work. They obtained $7,000 seed money from the Danforth Foundation to see what was going on, to bring in consultants and to tool up a pilot program for teaching students of low achievement (mostly below the 10th percentile on various achievement test scores.) This pilot program is moving now, and Forest Park Community College is asking for an $800,000 grant to implement it, mainly for the development of instructional materials. There is a great need for stimulating, independent study of equipment and material that would enable these people to learn more effectively. The emphasis is placed upon independent remedial work in a learning laboratory.

The next big grant that we've received is the Allied Medical Grant, as we call it. This is a Kellogg Grant of $168,000. It is thought that community colleges ought to train many more workers in the allied health fields, so the purpose of this grant is to ascertain "What job training at the sub-professional or semi-professional level could be offered?" and "What do their jobs entail?" (job analysis). Then we will make value judgments in terms of the demand for these people and whether or not we think we can provide the instruction and necessary physical and instructional facilities.

The other large grant awarded to our District is the Midwest Technical Education Center. I think the plan was to have one on the east coast, one in the midwest and one in the west, but only one was funded. Ours started with a grant from Carnegie of $115,000, its purpose being mainly to work with neighboring universities to do something about providing adequately prepared personnel for junior colleges. This involves counselors, teachers and administrators, who take internships with us, along with academic work at the universities. This grant was supplemented just the other day by $500,000 from the Ford Foundation. The District will work with Southern Illinois University where there is considerable activity in technical education. The major purpose of the grant is to increase the supply of well-prepared teachers for students enrolled in technical curricula in community colleges. Most of the money will go into stipends for interns, and there will be an internship core with us which will serve (1) the two year technical graduate who might become a teaching assistant or a laboratory assisant, and (2) three Master's degree programs for people who have backgrounds in general education, technical education or some related field. This will bring into our area 10, then 20, then 30 interns per year who are preparing to fill some of the jobs for which all of us are having so much trouble finding applicants. This project has been under the direction of the Director of the Florissant Valley campus with staff support from the other two campuses.

These are big general grants. They are not big in terms of those at many universities, but they are big for us.

Involvement of Members of the Faculty

The other things that I'd like to point out to you now are mainly some of the small - you might say informal or extemporaneous - projects of various faculty members working under the broad concept of "Let's see what we can do" or "Let's see if we can do this job more effectively." These are not related one to another, and this may be good. If one particular division goes off on its own experimental track, it might be just as well to have the stabilizing influence of more conventional - yet excellent work - in other classrooms. So we have not put these together; we've simply used them whereever they fit. Some of them do not deal with great numbers of students, but they are signs of innovation that we think show promise.

I would like to describe briefly some of our activities at the JCD which have resulted from an interest in innovation. (A series of 35mm slides will illustrate these.)

1. Instead of the traditional card catalogs in our libraries, we have book catalogs, prepared by data processing machines. Because our catalog is in book form, our faculty have the advantage of having copies in their division offices. Revisions are made three times a year, and between revisions, acquisition lists are sent out monthly to faculty and libraries. There are two volumes: one provides separate author and title indexes and the other a subject index. In each index, the entries include book classification number, author, title, edition (if any) and copyright date. This pertinent information is all that is needed to locate the book on the shelf. However, if there is need for more information, a code number is provided which refers the user to the Register which contains reproductions of Library of Congress catalog cards. Our books are processed by a service company and this gives our librarians more time to serve students and faculty. All new books are received at the District Office completely processed with classification number, card and pocket, and

plastic cover. All the librarian on the campus has to do is put the campus stamp on the book and put it on the shelf for immediate use.

2. We took bids on study carrels from a supplier, and they were quite expensive, so a local cabinetmaker built them for us at a ridiculously low price (I don't remember what it was, but I don't think he could stay in business if he built many at the figure.) The students like them very much. They're back in the far end of our library, and they usually fill up first.
3. Here is a reading accelerator. In our English classes we find that many of our students don't have the basic skills they need to get along. So we have a little corner of the library equipped with about a dozen teaching aids, and this is one of them. In our developmental courses, students spend most of their time in here working independently. We also have a shadowscope and other hardware to help them improve their reading skills.
4. This slide shows our custom-made audio-tutorial botany equipment mentioned earlier. The pedal on the floor permits the student to start, stop or reverse the tape. Our entire biology program for the first semester was developed by faculty members of the District. They experimented with Postlethwait's botany scripts and decided to adapt our introductory biology course to the audio-tutorial system. This was a very laborious process, but a laboratory workbook has been printed and copyrighted. Our earlier hardware was modified and refined, and the new equipment was installed in the individual carrels shown here. Presently, this course and the open laboratory have been very well accepted. It is our plan to build the laboratories in our

permanent building to accommodate audio-tutorial techniques and equipment.

5. We have a programmed language course written by an instructor who previously did a T. V. English literature course for the gifted youngsters in the St. Louis public schools. He's written a whole packet with handbooks to go along with the tape. This is essentially a way for a student on his own time to work on his difficulties. The student can go to the learning laboratory and practice and practice until he has mastery.
6. We use a Chester Dialog System for our language laboratory. A student, by dialing, can hear a given closed-loop tape recording which is mounted in the data bank. There are four tracks on a tape, and the only joker is that if I start on tape A and three minutes later someone wants tape B, he can get tape B, but he has to join me where I am. When you hear these things described, the feeling is that you have four tracks that are completely flexible; but the model we have is not, and I don't think there is a model that is. If the tape is short - 10-12 minutes - this is not a serious inconvenience. If you have 50-minute tapes, and somebody "gets on" after 10 minutes, he will probably be lost. The dialog system permits other academic departments to construct teaching tapes which are available to students at listening terminals in the library. One instructor in the District has proposals in progress for a motivational study using T. V. kinescopes to ascertain what factors influence the motivation of students.

The examples of experimentation which have been mentioned are ones of which we have photographs. There are many other such activities in process by instructors, and we expect thirty or forty projects will be approved for this summer.

SUMMARY

I would like to tie this together very briefly, if I may. In essence, I have been saying we have to assume that instruction can be improved and that the productivity of teachers and faculty members can be increased - at least, we like to assume it can. We believe - certainly, I believe - that the best way to do this is to subsidize instructional research and encourage faculty members and pay them to do some of these things that they believe in, that they want to do. This experimentation can't be done effectively while a person is teaching 15 credit hours in a regular school year. Either he must have a reduced program or he must be employed in the summer to do it. Our feeling is that there is no one answer to innovation or improving teaching and learning. Faculty members should be encouraged to develop in accordance with their own interests and hunches.

We've only made a small beginning in the area of innovation. We are eager to learn from others and from faculty members that we have not yet hired.

"THE ROLE OF THE ADMINSTRATOR IN THE IMPROVEMENT OF INSTRUCTION"

Stanford C. Ericksen
Center for Research on Learning and Teaching
The University of Michigan

Very briefly I will identify five issues but could, of course, stretch this list to ten or fifteen issues that emerge from this broad topic. I'll simply summarize five anchoring ideas as a basis for our later discussion.

I. Centralization versus Decentralization

I take the position that it is sometimes necessary to centralize in order to decentralize. The development of a computer-based instructional system can be used to illustrate this point. To establish a computer network for educational purposes, an executive or central processor must be available to serve the remote terminals. However, once the system is complete, each terminal has access to everything "in store"; all participants have equal access and capability and decentralization is complete. A similar sequence of moving from the "headquarters" to the local site applies in many other educational systems but the latter phase is sometimes omitted, forgotten or minimized--we'll underline this point later on.

One reason for starting my remarks with an emphasis on central decision-making is my observation that administrators are frequently more sympathetic to educational innovation than is the faculty while the faculty, in turn, is more likely to have better ideas about changes in teaching than those that students usually propose. Many observers, especially students, seem to reverse this hierarchy; I don't think they're right although I would have a hard time proving it.

With the support of the Administration, the University of Michigan faculty recommended to the Board of Regents that our Center be established as a place where they could turn for help with respect to innovation and new methods of instruction. I am glad that the idea of our facility came from the ranks of the faculty; yet I must admit that our faculty, like yours, is quite resistant to change, and one of the primary tasks of the central administrator is to counterbalance this resistance.

Another and perhaps a more obvious reason for centralization is the high capital costs and operating expenses of the new technological resources that are being used in higher education. Most institutions have found it necessary to centralize their audio-visual facilities, television systems and their computing centers.

Television is a familiar teaching medium. However, at many institutions around the country, television installations are gathering dust and rust because there was too much centralization without enough attention to the needs of the students and teachers as the decentralized users. Another example is computer technology which is even more expensive, so much so that the separate institutions cannot afford to underwrite its full educational potential. The recent Michigan legislature was asked to provide a half million dollars to start the necessary steps toward the development of an educational computer network which would make a common store of knowledge available to each institution within the state. In time, hundreds of terminals will be used by students and faculty and citizens throughout the state; literally speaking,the world of knowledge will be at their fingertips. We cannot do this alone at the University of Michigan or at Michigan State or Wayne State University, and even the federal government cannot do it without the support of academia. The logical unit is the state, along with the active participation of all the public and private institutions and with special emphasis on the community colleges as the prime users. Think of the implications when stored knowledge becomes a public utility!

II. The Difference Between Teaching and Learning

As administrators I believe you can probably appreciate and can accept the learning point of view in contrast to the teaching point of view. You have a perspective of the entire institution, and you see most of the factors that contribute to the acquisition of knowledge by the student. I do not intend to minimize the role of the teacher, but we shouldn't think that he carries the total burden of the educational process.

We're trying to establish a Residential College on our campus which will express, in part at least, the basic concept that the dormitory is an extremely important factor in the educational progress of the student. We must recognize that the outside-of-classroom experiences, the socializing, the bull sessions, etc., have been grossly neglected in higher education; and if we want to capture and direct these resources toward educational goals, something must be done in a concrete and brick and mortar way -- but only as the site for the more complete utilization of our humanized educational resources.

I don't believe any of you would claim that there is a universal prototype of the ideal teacher, and it has been my experience that most administrators are quite restrained about imposing his own concept of how the faculty should teach. You can, however, be quite active with respect to the conditions that promote better learning on the part of the students.

One of the basic formulations of the learning psychologist and one that I write on the blackboard in almost every course I teach is: $1=f(\text{var.})$, learning is a function of variables. As students, teachers, and administators, we want to identify and maximize the important variables. It is difficult to change the curriculum because curricular issues are interlaced with ego matters. The instructor says that's my course and we are quickly entangled in sensitive problems involving feelings of personal worth. Teaching is so highly personalized, teaching = f(me), that it is extemely difficult to examine teaching or to introduce variations because these usually have implications for the teacher as an individual. From the learning point of view, however, one is more likely to recognize the need to define clearly the instructional objectives and in many other ways accept the subtle but important responsibilities of the teacher as the director of the learning process.

You've heard the phrase "taxonomy of educational goals" and many commencement addresses amount to a definition of educational goals, but these are stated in almost mystical language that would be extremely difficult to define. Your faculty will be making a valuable contribution to the improvement of instruction if they will be more explicit regarding the instructional objectives of each course--what are the facts the students should learn, what are the concepts and principles he should understand, what procedures must he demonstrate and what attitudes and values are likely to be changed and in what direction? This taxonomy problem doesn't need to be as complicated or as threatening as people sometimes presume. But the faculty member is more likely to attack the problem when the administration says, in effect, "we aren't focusing on you as a teacher but are simply trying to achieve an objective inventory of the knowledge and skill, and attitude changes, etc., you want your students to acquire.

Finally, under the same heading of teaching vs. learning, and obviously biased to the learning point of view, we must face the matter of motivation. The usual method of handling motivation at the college level is the threat of failure, or the reward of a good grade, the dean's list or other manipulations of conditions that are extrinsic to the subject matter itself. College teachers have developed a rather fine degree of expertness in utilizing extrinsic motivation factors. We are just now beginning to learn how to appreciate the potential power of intrinsic motivation and the reward value of knowledge itself. Yesterday I talked with a young man in one of our professional schools who had arranged for a camera crew to take pictures of a few foreign students as they studied at the computer terminal. He was impressed by the expression on their faces as they showed the obvious good feeling that comes with learning and acquiring new knowledge. This subject matter teacher is excited about the tremendous power of intrinsic motivation. When a body of knowledge is well organized and presented under conditions where the students can control their own progress, they not only learn well but others can also see the pleasure that the learning process itself can provide.

III. Efficiency versus the Quality of Educational Change

The pressure to lower instructional costs is something we all feel. I am frequently asked why we don't use more television at the University of Michigan to lower instructional costs. We have an excellent Center, but we don't use television very much for on-campus instructional purposes. The first question a legislator might ask the Board of Education in response to a request for an extra half million dollars for a new program, would likely be: "How will this money be used to reduce the increasing costs of higher education?"

I could get on a soap box here, but I won't, other than to say that our Center is working toward the idealized goal of the individual student as a unit of instruction, and in time I am convinced this can be done as efficiently as the lock-step form of mass education. When a college claims that it can save money and even make money by more "efficient" management, we should look closely to see whether or not there is a trading off between recognizing the individual student to gain managerial efficiency in educational arrangements. Diversity is very expensive and in one form or another seems to cost more money than almost anything else in education. If, for example, the teacher is simply passing information on in one direction, there is no logical limit to the size of the class as long as the students can hear the speaker or see the screen. In effect this is using the mass communications model, and the way to evaluate efficient teaching would be to call in the A. C. Nielsen Company and get a rating. Anything that adds diversity or, in fact, permits greater individuality, is extremely expensive; and the quickest way to save money is to reduce that diversity. Not being an administrator, I can say that the last place education should try to save money would be to sacrifice individuality in the aspirations and the educational achievement of our students. The individual is the anchoring concept in a democratic society, and I believe that the best educational potential of automation and technology is the means they provide to individualize and to break the mass communication model.

IV. Hardware versus Software

This is an overworked distinction, but one that needs to be emphasized since we must discriminate between the means and the ends. Here I am coming close to some sacred cows, but I want to caution you against the media pitfall. A number of groups are pressing for educational networks of one sort or another--TV, radio, telephone, computer, etc. All of these networks are subject to the limitation of emphasizing the medium rather than the total educational system. I notice that one of your speakers will present the systems approach, and I would encourage you to attend class that day because he may give you a point of view that will help avoid the focus on any one component.

Why is there so much discussion about class size, about the I.Q.; and why do we define an educated man in terms of knowing how to spell? All of these things are get-at-able, measurable, factors and these elements soon become overloaded with research and administrative attention. In some respects the emphasis we place on the medium in education is the same fallacy that the automobile people have made in their emphasis on styling instead of safety. Any time one component of a complex system gets undue weight, sooner or later there will be trouble. We certainly have not done our job as educators when we get the information out to the student. In fact, the simple presentation of information is often the least demanding aspect of good teaching.

Here is a new publication, one of the many clearinghouse reports that are useful in education: "Abstracts of Instructional Development in CIC Institutions." This is a "U.S. Mails" network in which each institution provides no more than four summaries of innovations in teaching on that campus. The whole emphasis is toward the subject matter teacher, rather than on the hardware means of presenting information. It is assumed that the chemistry professor at Michigan State, for example, may be interested in knowing what his colleagues in the other Big Ten schools are doing to develop new ways of teaching chemistry, and so on down the list of teachers in the other academic disciplines.

V. Teaching versus Research and/or Service

As an administrative officer in a community college, would you, in good faith, encourage one of your faculty members to spend the summer programming his subject-matter for the computer; would it be a rewarding way for him to spend the summer? His product will not appear as a published article or as a book, but he is making information available that might be retrieved and modified by a teacher at another institution. If you think that this would be a good way for a teacher to spend his time, then I'm sure that sooner or later a number of them will do just that. In other words, you are in fact, rewarding the pedagogical efforts of your faculty members.

We have a Wolverine Fund at our Center which is one demonstration that the administration was willing to put its money where its mouth is. We earmark part of our budget as "belonging to the faculty." I think this is a good idea and believe your schools should do the same thing. Classroom experiments will be done better if a little money is available to pay for extra services, materials and supplies. The idea of the Wolverine Fund is simply to support instructional innovations and curricular upgrading. Perhaps a pilot project will be initiated by a given teacher that may lead to formal proposals for outside funds, greater department support and the like. Each institution should be prepared to spend some fraction of its budget on improving the primary purpose of the institution, namely the teaching of students.

In some form or other (you can appreciate the bias here) perhaps something like our Center should be made available to your faculty if only in terms of just one person. Instructional arrangements and research today are too technical and too complicated to be handled by the left hand. This is certainly true if your school becomes involved with computer-based systems of instruction and with the other means of utilizing the new resources that are becoming available to education. In a general way, perhaps your most valuable potential resource will be your ability to utilize the contribution that can be made to your educational program by other institutions. It is my honest opinion that the community college offers a more attractive setting for pedagogical research than many of the older or larger four-year institutions. It is extremely important that you define good teaching, reward these activities, encourage innovation, and evaluate the results, and thereby establish a truly significant position of leadership in American education.

I think it is now high time we shift from a one-way lecture class and become a discussion group. Your ultra-realistic involvement in educational problems is the appropriate testing ground for the strength and the weakness of the pro and con aspects of these five issues and the many others.

"THE NATURE OF OPERATIONAL GAMING"

John Forbes
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Metropolitan St. Louis, Missouri

A game is a model or gross replica of the major decisions and environmental forces influencing decision-making that exist in the operation of some purposeful enterprise. Individuals or teams of players compete against one another and against the environment in playing a game: (a) by making decisions regarding operations in the simulated enterprise; (b) by seeing the effects of these decisions upon the model; then (c) by living with the results of their decisions in subsequent rounds of decision-making practice.

As instructional devices, operational games differ markedly from case studies and other forms of simulation currently used to prepare college administrators. A case study in any of its various forms is a static device. No matter how realistic the symbolism might be surrounding decisions, in a case, once decisions have been made and discussed, the case model has served its usefulness. Gaming models, by virtue of their infinite extendability in the number of rounds that can be played, provide dynamic training exercises. The effects of decisions made in one round of play set the stage for decision-making in the next, just as in real life. Games, then, retain in their decision-making environments all the virtues of realistic symbolism.

The College and University Planning Game, recently published by the Academic Planning Tool Center at New Mexico State University, can be used here to illustrate what I am trying to say.* This game simulates the results of five historical years of academic planning for a fictitious institution of higher education. Those who play the game are required to make planning decisions for five future years. After each round of play (one year of simulated planning) the decisions of each player or team are scored by a referee. The game may be scored manually or with an electronic computer. The status of the simulated institution is altered then in terms of the quality of decisions made. In every round of play decisions must be made for the following aspects of institutional operation:

(a) A five-year forecast of student enrollments;
(b) A two-year projection of space needs;
(c) Expansion of degree programs;
(d) Setting admissions standards;
(e) Revision of student tuition-fee charges;
(f) Setting faculty salaries;
(g) Budgeting for library, instructional equipment, and publicity expenditures;
(h) Assigning faculty work loads for teaching, student advising, research, field service, and committee work; and
(i) Recruiting faculty with different levels of professional preparation. The players also must express their planning decisions in fiscal terms by preparing an anticipated budget.

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*At the present time three operational games for education have been published by the Academic Planning Tool Center at New Mexico State University. In addition to the college game mentioned above, there are the *School Personnel Management Game* for training public school administrators and the *NCPEA Demonstration Game*. The latter is a highly condensed model designed for use in conference situations to acquaint people with gaming.

The decisions above interact within the model to produce Institutional Quality and Reputation Scores and new annual enrollments for the institution. Also generated by the interaction of decisions are a number of analytical measures for evaluating operations. Among these measures are student-faculty ratios; student-credit hour production and other costs; percentage of Ph.D.'s on the faculty; student attrition; faculty morale and turnover; accuracy of the enrollment forecast; square feet of space available per student; and a statement of actual income and expenditures for the previous year.

Player decisions in this game also are made against the backdrop of realistic, conflicting human forces emanating from the service area of the simulated institution. These forces are made to shift and change during the gaming exercise to help generate a high degree of player interest during the gaming experience.

A post-game discussion follows the fifth round of play. In this discussion the individuals or teams playing the game review and analyze their various decision strategies and the results produced by them. Most significant in the post-game discussion is a critique of the scoring weights and measures used for refereeing the game. In evaluating this mechanism, players are made more of one mind about their concepts of good institutional operation. For, invariably, as people from diverse areas of institutional operation analyze the game's scoring system, they discover many values with which they disagree, or the validity of which they prefer to question. If skillfully channeled, these negative reactions can lead to the structuring of many meaningful institutional studies. Once completed, results of these studies can be brought back to the group for integration into, and improvement of, the planning rationale. Players also discover other operational areas for which additional games can be constructed and functionally integrated with the first one. Thus, in a systematic manner the game serves to evolve an agreeable, expanding rationale upon which increasingly more intelligent planning decisions can be based throughout the totality of the institution.

The College and University Planning Game is designed to simulate the major operating elements of a complex, multi-purpose university. But it can be modified easily to simulate any type or size institution of higher education. The external environment employed in the game which influences decision-making can be adapted to the realities of any institutional setting as well. The game also can be modified for use in several departments or colleges within an institution. By exchanging games and playing them, people who work in different elements of organization within an institution can learn much about the totality of management problems on their campus--particularly the operational problems of others.

The College and University Planning Game can be extended easily into the operations of organizations with which colleges and universities relate. An accrediting agency, for example, might develop a model of its accrediting procedures which people in institutions could play in order to infuse that agency's education standards into their institutional planning rationales. Or the agency might wish its personnel to play many different institutional planning games in order to infuse the values of good education held by educational practitioners into its evaluation rationale. Many adaptations of this kind can be created for any of the outside organizations with which colleges and universities relate. All that is needed to effect these creations is the application of additional effort and ingenuity.

Manual or machine options for refereeing this game did not come about by default. We deliberately chose to design our college planning game that way with a specific end in mind. As people in discrete educational settings expand upon their games, they can use the manual scoring device to hammer out expanded planning rationales. At some future point in time, these people will have constructed sufficiently comprehensive decision simulations which can be made to serve as general planning models. Then, if their computer scoring programs have been expanded apace with the manual scoring device, they can benefit from automatic planning models. Much of the complexity in current planning and decision-making can of course be eliminated by means of such models. This fact, in and of itself, should contribute importantly to the restoration of more wholesome human relations within the ranks of college management. We are not, however, quite to that point in our development of management tools.

"NEW DEVELOPMENTS IN LEARNING AT BELL TELEPHONE"

C. Glenn Valentine
General Staff Assistant-Training Methods
Michigan Bell Telephone Company

Although this presentation involves "new developments," I'd like to take you back about five years and give you a rundown on a research project. I will call it research, although it was actually an exploratory study, that took place at Bell Labs in New Jersey. This study gave us the impetus to move into programmed instruction and also to evolve our training into the kinds of programs that I'll show you a little bit later with slides. What we have tried to do in the last five years at Michigan Bell is to convert much of our group instruction to individual instruction and use programmed instruction where feasible. The programmed instruction has evolved from the first kinds of programs that were feasible, simply linear frames or answering questions by filling in the blanks and sequences, getting confirmation of the right answers etc., to a point where we're now giving the learner quite a bit of freedom in selecting the style and technique that he will use in achieving the objectives of a course. We state the objectives before he begins. Some of this I believe you've seen. I think you've visited Oakland Community College this week, and you saw there some of the kinds of things that you'll see this morning.

I'm going to comment on a few points that we use to guide our own thinking in developing our course materials. This slide presents a group of six topics in the learning or teaching process, and we try to adhere to these as much as possible.

First of all, we try to keep active participation on the part of the learner. What we're doing with our development is to force the learners to respond continuously as much as we can. Also we try to make these responses as relevant as possible in terms to the real world where they will be using these skills and knowledges.

Second, we attempt to, and I use this word with a lot of reservation, reinforce the desired responses. We attempt to devise some technique, either by confirmation or immediate feedback or other methods, to reinforce the desired responses.

Third, we try to build into the program a certain amount of relevancy for the learner. We do this by simulating as much as possible, real world conditions. We use introductory statements and overviews of the programs each time we enter a new program to establish relevancy for the learner, so that he recognizes the actual involvement this takes him into as far as his coming job.

Fourth, we try to tailor to the individual. We use tutoring, on-the-job follow-up and programmed instruction or programmed learning. In this tailoring, by use of programmed instruction, we attempt to unitize the programs rather than build long programs where every learner has to take the entire sequence of maybe several hours or several days of instruction. We build the programs in small units using pre- and post-testing and have the learners only take those units where they fail in the pre-testing. Where they pass the pre-test they skip this unit of training. We attempt to use as much visual aid and audio-visual equipment as we can modify and use. In many cases we've had to modify commercial equipment, because that which is available does not match our learning principles. One type of audio-visual device is a tape player with synchronized slides where an audio tape triggers slides automatically. One thing that commercial manufacturers have not built as yet is an audio-visual device of this type which has an automatic stop on the tape playing section. On the audio tape response, requirements need to be followed by an automatic stop so that when the tape or the audio portion asks for a response on the part of the learner, the learner must be concerned only with the desired response and not with pressing a button or listening for a beep on the tape. Any activity which is irrelevant to the response being asked for interferes. Unless a tape stops automatically, we are unable to keep the active participation relevant. So we've had to modify the commercial audio-visual devices. You'll see some of these modified machines this morning at our plant school. Finally, where it is necessary in terms of problem solving and overlearning, we have had to build in a lot of practice sessions. We attempt to do a lot of this at the learners own pace.

This next slide presents the features of programmed learning that we consider and make use of in our program development. For us, the first three make up the definition of programmed instruction. Anytime we can build a program where the learner is actively participating and there is immediate feedback, confirmation of responses, and the materials are pre-structured and pre-prepared, we call this programmed instruction. This may differ from the thinking of some programmers. This does not mean that we will end up with a series of statements with blanks. Many times our programs have statements with no blanks at all. The entire program is a sequence of response requirements with immediate feedback of their correctness, with all of this material pre-structured and pre-prepared by what we hope are experts in the field.

Some other features of our programs are: (1) We can self-pace them for each learner, depending on his own individual rate of learning. Thus, we can allow him to move at that pace. (2) We may build programs which are group-paced. They require some additional equipment at times and some very careful use of the program by the instructor or the administrator, but they can be group-paced as well as self-paced. However, most of our programs are self-paced. (3) We can tailor the training to fit individual needs. We do this by pre-evaluation or pre-testing. We use diagnostic testing before they enter the program, and again we use individualized or unitized programs so that we can give the learner only those units which he needs.

Another item which has come to be very important to us in industry is scheduling the training to fit the individual availability. Whenever the individual is free to take the training, we can enter him in the training. We have classrooms in which we may run five or six courses simultaneously with the same instructor. The programs are all individual. They're unitized with diagnostic pre-testing and so forth. When the learner comes in, he's given the pre-test, selects the units that he needs, and only those are administered to him. When he completes the program, he returns to the job. In terms of public education, this possibly would be a disadvantage due to the fact that the variability of time that it would take for students to go through certain units. I'm certain that many students would complete a semester's work in two to three weeks, while other students might take two or three semesters to complete what you now consider a semester's work. We'll have to adjust to that kind of thinking if we should use this approach in education.

In answer to a question-----We train all the new employees; most of them do not have previous training. The present labor market is such that we can't find people with electronics backgrounds, etc., so we must train our own, and all of the new employees receive some training. We don't train them completely during the first few weeks with the company. They will usually get two or three weeks of training, and then they will go on the job for a year or two years, up to maybe five years. Then they will come back for an intermediate series of courses, go back to work for a few more years; and maybe by the time they have 10 or 15 years service, they are completely trained employees. We use what you might describe as career training. We attempt to spread their training over a long period of time.

We use systems approaches as best we can. We admit that we haven't gone the entire route of systems approach, and this is because we don't go out and actually analyze the population as well as we should to determine the exact pre-requisites and the nature of the students coming into our classes. We have put most of our emphasis, as you will probably see today, on the middle part of the systems approach, and that is in the methods and techniques of learning. We've attempted to devise both audio-visual aids and programmed instruction by various techniques to improve the middle part of the systems approach. The last part, the follow-up to post-evaluation, the analysis of how well you've met your objective, the analysis of whether those objectives are actually needed on the job, and whether the students actually make use of the objectives that you taught in your training, we have not begun to cover. These parts of the systems approach are in the plans, and we hope to get to them in the near future.

As a result of programmed instruction we made use of systems design in three ways. One of the three features that we have been forced into using is behavioral objectives. Up until this time if we designed a course, the course writer or the person who designed the course materials for our instructors would simply list 10, 15, 20 pages of things which the student should know when he is through. This would usually involve phrases or terms such as understanding, be able to use, or be able to solve problems. In going into programmed instruction, the course writers and developers are forced now to state specific behaviors that they want as a result of this training. They must begin their developmental sessions by listing all the behaviors that the student will have to perform at the end of the training. So we have been forced into using behavioral objectives. This isn't necessarily unique to programmed instruction, but programmed instruction has forced us to do this.

Second, we've found that we now have student-oriented materials rather than instructor-oriented materials. Instead of the teacher or the instructor becoming the master of what goes into the course, the students now determine what goes into the course material. As the objectives of a course are completed and we begin to develop the program materials, we get feedback from the pilot classes and from the learners; and this feedback in turn is used to modify and revise the programs. As a result of programmed instruction, we've forced our materials toward student orientation rather than intructor orientation.

Finally, and possibly the most important thing we've achieved through the use of programmed instruction is that we now have a continuous, comprehensive evaluation of each individual in the class. As they enter the training we use diagnostic tests that identify their weaknesses and strengths. At any point during a course, you may walk into the classroom and pick up the reports of individual records and see the rate of learning, the weaknesses, and the areas of strength of each learner. You have not only the continuous records, but you have comprehensiveness. In other words, our examinations after each unit as well as the pre-tests are diagnostic, and from them we can determine which areas are weak and where the learners need help. The instructor, or the administrators as we are beginning to call them rather than teachers or instructors, can actually go back to this student after looking over the records and tutor or otherwise assist him in those areas where he needs the help because of this kind of diagnostic look at the learner.

You have a notion now of our thinking and our approach to learning problems. Now I want to back up the five years that I mentioned earlier to a study that we ran at Bell Labs in 1959, 1960, and 1961. The objectives of that study were to compare a program course and a conventional lecture course both in time and proficiency. We used basic electricity as a content topic. We built the program, I say this nonchalantly, but it took us some 20 months. We began by writing a little over 5,000 objectives and ended up with something like 6,000 frames in the program. This was revised down to something less than 4,000 frames. It was a 20-month period and two of us, Dr. Myron Woolman from Washington, D. C. and myself, worked many hours to build that program. But after building the instrument, we ran this study. We put the program into both book format and machine format. We wanted to compare books and machines and see their effectiveness in terms of time and proficiency. We also ran the study for 6 months delay testing after the class. All the students were brought back, and we gave them a six-month-delayed retention test to determine retention of both facts and depth of understanding. We took notes on several subjective-type things such as the effects of fatigue and content difficulty on different levels of I.Q., content difficulty on different reading levels and motivation. Also we observed the difference in use of books and machines as far as I.Q., fatigue and motivation. Most of these observations gave us very little information. There were either no differences or no significant differences, or our sample was so small that we couldn't make any useful deductions from these observations.

Here is a look at the original machine we used to conduct the study. Each unit of the program was printed on about 300 feet of five-inch wide adding machine tape and mounted on a reel in the back. The paper tape fed under the machine, up through a window, onto a take-up reel in the front with a knob on both sides so that either right or left-handed students could use it. The student would write his responses in a window and then would turn the knob. His response would move up under the glass, and the correct response would appear in the window where he had just finished making his response. He could then compare the responses and move on to the next frame. We had a little button on the right which he would depress if he made an error. This would simply put a hole in the tape so that we could easily analyze the error rate later.

We built along with the program an auxiliary panel book, and I'll elaborate on the use of panel books a little bit later when we get to the Michigan Bell programs. The attempt here is to cue from the program to visuals. These were black and white line prints with one addition and that is that we put a field of responses below each picture. We had about 30 names or phrases that were listed below each panel sketch, and the response that was required was always in that group. This allowed us to force the response to a particular technical response, or if there were several options the learner could pick the one which was on the list rather than be confused about which of the synonyms he might want to use to make a certain response. We could use this method to guide our students toward more technical terms. We'd allow them to make general responses in the beginning and then as they moved on through several frames, we would remove the general responses and force them to the technical responses.

Let us take a quick look at the design of the study. We gave four types of pre-tests. We gave an Otis I.Q. and employment test, the Davis Reading Test Form B, Electrical Pre-Knowledge Test and a questionnaire to determine educational background. The Davis Reading Test Form A was given at the end of the session and two types of technical examinations. One of the two groups was a lecture class which was conventional in terms of the Bell System Industrial training. This class included films, quizzes, discussion periods, blackboard work, test book references, homework, and a few other techniques that were normally used in what we call a lecture-discusion class. In the program class, half of the group used books and half used the machine program. The learning process involved here was almost entirely in the program. There were no auxiliary materials other than an instructor in the room if they wished his help. Anytime he needed help, he could raise his hand and get help from the instructor. Other than this there was no auxiliary type of homework assignments or any other conventional methods such as board work, discussion groups, feedback on the tests or anything other than what they asked the instructor. This group received the same post-tests as the lecture-discussion group. Six months later we gave the retention tests and a questionnaire to determine what had happened to them in the six-month period. Did they take advanced training? What kind of work did they do? Did they take any auxiliary training? Did they read any books which were related to this course? From this questionnaire we determined the one thing that affected retention significantly was the type of work or the type of advanced training they might receive. Most of those people who received advanced training or went into work areas which used the information taught had either equal or higher test scores at the end of the six-month period. Most of those people who did not make use of the material in any way, had some attrition in their scores.

We had 37 in the programmed group and 35 in the lecture group. These students made up four classes in each group.

This slide is a chart of the results of the study. In the lecture class there were 9 six-hour days available. The instructors estimated that there was a net class time of about 44 hours. In the self-instruction class we kept a record of the times that were spent; the average net time was 43.6 hours. In terms of time-difference, the two groups had taken about the same amount of time. However, the range of time for the self-instruction class was 25 hours for the fastest student and 75 hours for the slowest student.

Here is an interesting little side note. A later group of students in Montreal for the Bell of Canada Company, including mostly young people between 18 and 20, was given the same program, and they had to pass this course in order to keep their jobs. The average time for the group in Montreal to complete was about 18 hours, and most of them passed.

The students that we had in our study were Bell System employees with an average of 10 years service with none less than five years service, and the average age was around 32 or 33 years old. The final exam consisted of a conventional exam using multiple choice responses and a conceptual understanding test which was a kind of unique forced-choice test. The conceptual exam had about 15 items in which the students had to select from lists of 30 or more fringe terms about a statement that was given. They were forced to dig into the concepts and make use of the facts that were taught in the course rather than simply relating back from memory the formulas and definitions. The lecture class had a mean of 65 percent versus 77 percent in the self-instruction class. The conceptual tests showed 46 percent for the lecture class as compared to 65 percent for the self-instruction class. Both of these differences are highly significant, both of them below the 0.001 probability level in terms of the significance between the means. Six months later, on retention tests we found the average score was about 85 percent of the scores at the end of the course. On both the conceptual and facts test as well as for both groups, the retention was between 80 and 90 percent. However, in the one group, the self-instruction group on the conceptual test, we found the retention to be significantly below the lecture group. This score of 55 percent was still significantly higher than the 46 percent scored at the end of the course for the lecture group. At about the same time we were running this study, another group at Bell Labs was running a study in which it was determined that most of the attrition occurs in the first three weeks. Since this test was given six months later, we assumed that at this point these scores were pretty well leveled off. If we had tested a year later there would not be much decay from these scores. That may not be a correct assumption, but from the evidence we felt safe.

Some very interesting items were found on our test score distributions. These were very important things as far as cost studies for use in obtaining approval to go into programming at Michigan Bell.

This slide shows a distribution of the times of the experimental group and the fixed time of the lecture group. Notice that the time ranged down almost to 25 hours while there was one student at nearly 75 hours. This rather small sample distribution approaches a normal distribution. What you normally expect in a lecture class is that you'll get a normal distribution of the scores with the fixed time. This is what we have in the lecture group. As far as the scores are concerned in the conventional group, we get a distribution symmetrical about the mean. But when you look at the distribution of scores in the experimental group, you find the variance decreases and we have a block of high scores.

All of the failures that we normally would have had in this group are in passing regions. Normally as we have fixed time in the lecture group, we find that the people who take a fixed amount of time have their scores distributed around a mean. Because they were allowed more time, these people that normally would have failed move up into the passing region. Most of the brighter students were able to improve their scores. In other words, if we plotted across the board I. Q. bands of say 10 points, we would find that there was improvement at all levels of I.Q., not just at the low levels. All levels of I. Q. seemed to show some improvement, but the greatest improvement was shown in the lower I. Q. people.

There was a tendency to lower variance on the test score distribution of the programmed group. Therefore, in this particular group we traded time for scores, giving some of them more time to allow them to pass while the brighter students are making up for it by going through in much less time. Thus, we spend the same amount of money but have no failures.

Let's take a quick look at a bright little chart on some of those subjective observations. Probably our most important finding in the subjective area was that we observed that students began to tire very quickly when using a straight linear program. We gave them a program and asked them to sit for six hours a day and answer questions by writing answers in the blanks or solving problems one right after another. After about two straight hours they began to tire. After six hours even with breaks, we found that most of the instructors estimated their effectiveness was down to about 25 percent of what it was when they started in the morning. One factor which we found to be very important in assessing boredom was the movement of the chairs on the floor. If we watched the students without noting what they were doing in the program, we found that when the chairs started to move around, slide back and forth or slip sideways their error rate was going up. The more they moved or the more fidgety they became, the greater the error rate in the program. Of course as the error rate goes up, we assumed that there was less learning. At least we were sure that they were not making as many correct responses when they're having a higher error rate.

We attempted then when we moved to Michigan Bell, to implement the program with some techniques which would offset this fatigue which takes place when students are forced to respond to a type of program that is the same hour after hour.

We found motivation was extremely high. All the students had very positive statements like, "For the first time in my life I feel like I'm learning something," or "Why isn't everything taught this way now?" These kinds of statements did not come just from one or two students, but almost all the students coming through were positive in their comments. We knew that since we were a Bell Labs team and in the Bell System, there would be high motivation to participate in the Bell Labs Project. Anything sponsored by Bell Telephone Laboratories has a sort of prestige or status, and since these people were participating in a Bell Telephone Laboratory project this produced some of the motivation. We attempted to build up the status and prestige of the project for the lecture group by telling them that they were also a part of the Bell Labs project, but I'm sure that once the lectures began and with six hours a day of classes, this fact probably lost its meaning. We also know that the instructors in the conventional classes made a little extra effort to beat the Bell Labs team, so we assume that the lecture classes were getting a little better treatment than usual because they were participating in this project. I'll just add a note on this motivation. We began programmed instruction at Michigan Bell in 1961, and our first program went into effect in late 1962. We've now had over 500 students through the 140-hour program in electronics, and as far as we can tell there is no lessening of that motivation. We're still finding students who will walk in, sit down and say,"Here I am, teach me." The program is placed in front of them, and we walk away. Nothing happens until they start responding, and we'll find that within a day or two they're digging into the program just like everyone else. By the time the end of the course arrives, they're as motivated and working as hard to achieve the check-out quiz courses as anyone else. So we find that there is a kind of inherent motivation in the use of the programs, possibly due to the individual being free to move at his own pace. Whatever the reasons, there is a need for research in this area. For some reason the programs and the self-pacing feature produces motivation.

In the Michigan Bell general electronics programmed instruction course there are eighteen units, of which 13 are laboratory exercises. When I say laboratory exercises, I mean completely programmed laboratory exercises with continuous responding, immediate confirmation, self-paced, pre-prepared materials, etc. Each of these units has a check-out quiz which is diagnostic. When the student completes a unit, he takes one of these quizzes. It is divided into portions, so that if he fails any one portion he is fed back into the program he just completed to re-study that section which he failed. There also is a ten-part performance test. These are live-circuit tests in which the student must perform with equipment and live circuits similar to what he will find on the job. These are spaced at five different points in the program. There are two parts given at each point. Each of these points is critical to his success in the program. He must pass the two-parts of the performance test at each of these points in order to procede. If he fails the performance tests, he will then be shuttled back into the areas in which he is weak and take the training again. He will then be given an alternate form of the performance test. If he fails it again, he may take some more training and come back for a third time. We've never had anyone repeat a performance test four times. Usually they will decide for themselves at this point that electronics is not for them and will ask to be returned to the job. We have not had to send many of them back. Most of those who fail decide for themselves that they do not want to go on with the studies. The failures that we have in this course usually eliminate themselves or are eliminated through counseling,etc., before they reach the final. We do give a final exam although it has begun to seem unnecessary. Over 400 students have gone through the program, and with a few special exceptions we've never had a failure on the final exam. Thus it is questionable whether we should even give it at the end of the course. All those having passed all the check-out quizzes and met the requirements on the performance test have passed the final written examination.

Our electronics classroom is divided into three parts. One part is an all-verbal section, and this is similar to the kind of program we used in the study at Bell Labs. The student will be asked to make a series of responses by writing answers in blanks, solving problems, or recognizing components from pictures and diagrams. This will only last about two to three hours (remember the fatigue problem). At the end of two to three hours, he is moved out of this part of the program and given a short quiz to determine how well he has learned. If he passes the quiz, he is then moved into a laboratory area. He can spend two or three days here without becoming fatigued, because he is manipulating objects, working with instruments and equipment; and we find that mental fatigue doesn't take place, possibly because he is up on his feet a good portion of the time.

In the all-verbal booth he sits on a fairly comfortable chair at a normal-height desk; in the laboratory he has a stool with a high counter in front of him. In one program he is manipulating objects, doing things, upon directions from the program; in another he is answering questions. The instructor controls the activity. All the written tests are given in the verbal booths. Our single-concept films will also be shown in these booths when we have them developed. Those are in the planning stages and aren't developed yet.

We can run up to 22 students in the classroom. About 18 is our average number of students in the room. They enter and leave at a random rate. Formerly, when we were teaching this course with the slides and the lecture-discussion group at Michigan Bell, we used about eight students in a classroom. Since we are now using two instructors, we've actually gained a student as far as the instructor to student ratio. This may seem like a very low ratio to you, but it is the most efficient one that we can use as far as producing the trained technician. We have to keep in mind that all the time that a student is sitting in this classroom, we are paying a cost of something like $6 to $7 per hour. We have found the most effective ratio of students to instructors in the lecture classes is about 8:1. We are able to go to a ratio of about 9 or 10 to 1 in this program. This ratio would possibly be the most efficient in public education if you had to account for the value of each student's time. Normally public school costs involve materials, wages, and overhead; but if you had to pay these students for the hours they cover in your classroom, then you would very likely find some more efficient methods of teaching.

This slide presents the time distributions for the programmed classes as compared to our conventional classes. In the last conventional classes we ran there were 36 students, and a fixed time of 120 hours was used to teach this course. Notice this was a much more involved course than the one we studied at Bell Labs. The course used in the Bell Labs study had an average of 44 hours; this lecture course was 120 hours. The program that we're using is a revised and expanded version of that early program. The time for the 59 people who took this programmed course was an average of 140 hours. So we increased the time by about 20 hours on the average to get the students through this new program. However, there are a great number of our students who complete the program in less than the 120 hours, and these turn out to be the brightest and most productive workers that are back on the job sooner. The slower students, although they are taking longer to get through the program, are not failing the final exams. The students in the lecture classes who took 120 hours to complete the course had over 45 percent of their group failing on the same examination. In other words, in the conventional class over 45 percent were failing the examination, while the programmed group had no failures among the 59 people who took the course in the last half of 1964. There were, however, 18 failures who were scheduled into the class but failed to reach the final examination. They failed or were returned to their job very early in the program. Therefore, in the programmed group we had about a 30 percent failure, but these men were identified and were removed from the program very early. All of those people who went through the program passed.

In terms of the relevance of the program, I'll try to give you some validity studies of the testing. We went out into the field and selected 71 people who were experienced technicians holding second class FCC Radio Operators' licenses. We brought them into the school and gave each of them the same final examination. This is the performance exam, not the written exam. The distribution of those 71 people shows scores all the way from very low failing marks up to very high scores. The distribution on the performance tests of those 59 people who went through the course shows no score below 50. Yet, there are about 25 to 30 percent of the existing technicians who would score below 50 (which is our passing score). In other words, as far as this test is concerned, the people who complete the course are actually able to perform better or as well as the top half of the existing top technicians in the company. These people holding second class licenses are considered roughly the top five percent of the technicians in our company. So these course graduates can compete with them on this test. The second question we ask ourselves, then, is how valid is the test? We made a rating study in two areas: we picked advanced courses, courses for which electronics is a prerequisite. We had the instructor rank-order his class and rate each man in terms of high to low performance on a 9-point scale. We selected all those people who were ranked in the bottom third and below average. Then we went out into the field and selected the crews in which these men were located and had their supervisors rank and rate their crews. We again picked those people who fell in the bottom third of the crew and who were ranked below average. Where there was a match, that is, if he was both low in the school and low on the job, we called him a low performer and put him in the study. We also did the same thing for middle performers and top performers. We ended up with three groups of people, low performers, medium performers and high performers. We then gave this test to a sample of these people. The distribution of the low performers had a mean of 31.4 and all scores below 50. The distribution of the medium performers had a mean of 43.3. The high performers had a distribution completely above 50 with a mean of 58.7. Each of the items or parts of this 10-part test have similar distributions. In other words, the test is valid not only for the total scores but also for each part. In each part we required them to score 5 in order to get through this course. Using this chart we can then predict, with a probability of near 1.0, that all of those people who fail the course would have fallen in either the low or the average group of performance on the job and that all of those people who passed this course will be average or better on the job.

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Spring Session
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SIXTH ANNUAL COMMUNITY COLLEGE PRESIDENTS' INSTITUTE

Summer Session
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